The
GEOGRAPHICAL JOURNAL

Vol CXXVI Part 4 *December 1960*

VOLCANIC ACTIVITY ON THE PATAGONIAN ICE CAP

ERIC SHIPTON

THE MAIN PURPOSE of my second visit to Patagonia in the summer of 1959–60 was to locate and investigate an active volcanic vent, which was believed to exist somewhere on the southern of the two main ice caps. The evidence that there was such a vent had accumulated over very many years. For example, nearly fifty years ago some travellers had described showers of volcanic ash falling near the western end of Lago Viedma; deposits of volcanic *ejecta* had been observed on the O'Higgins Glacier, the Chico Glacier and elsewhere in that area; and, according to de Agostini and others, settlers near the shores of Lago O'Higgins* had talked of seeing, on several occasions, great columns of smoke rising from the ice cap to the west.

In 1933, a party led by Dr. Reichert reached the ice cap by ascending the O'Higgins Glacier from the southernmost branch of Lago O'Higgins. For sixteen days they were confined to their tents on the edge of the plateau by violent storms, and by the time these had abated their supplies were nearly exhausted. However, they pressed on westwards and reached a point near the main divide. Visibility was still bad, but when they were at about their farthest point it cleared for about a quarter of an hour and they saw, close at hand, a "volcanic cone," some 3000 metres high, from which clouds of steam were issuing. For some reason Reichert's discovery did not receive the recognition it deserved, and in the subsequent speculation about the existence and whereabouts of the volcano it seems to have been largely ignored. His route to the ice cap had been followed twice, in 1957 and 1958, by parties led by Hugo Corbela, but no fresh evidence had emerged.

In 1944–5 the American Air Force made a series of survey flights over the range. Examining the photographs taken on these, Professor Keller of the University of Chile and Dr. L. Lliboutry found what they thought to be an active vent on a large rock outcrop in the accumulation area of the Viedma Glacier. In 1952 observations made by Lliboutry on another flight seemed to confirm this belief, and the outcrop came to be known as "Vulcan Viedma." It was not likely, however, that this was the origin of the volcanic deposits found in the vicinity of the O'Higgins Glacier; nor could it account for the eruptions seen by settlers on the shores of Lago O'Higgins. Lliboutry, who devoted a section of his book 'Nieves y glaciares de Chile' to a review of the question, was inclined to the opinion that the active vent or vents causing these phenomena were not located on any of the mountains rising above the ice cap, but rather that they were fissure volcanoes which erupted periodically and were covered by snow and ice during their intervening periods of quiescence. He noticed on the American Air Force photographs a number of peculiar markings

* The eastern part of this lake, which lies in Argentina, is called Lago San Martin.

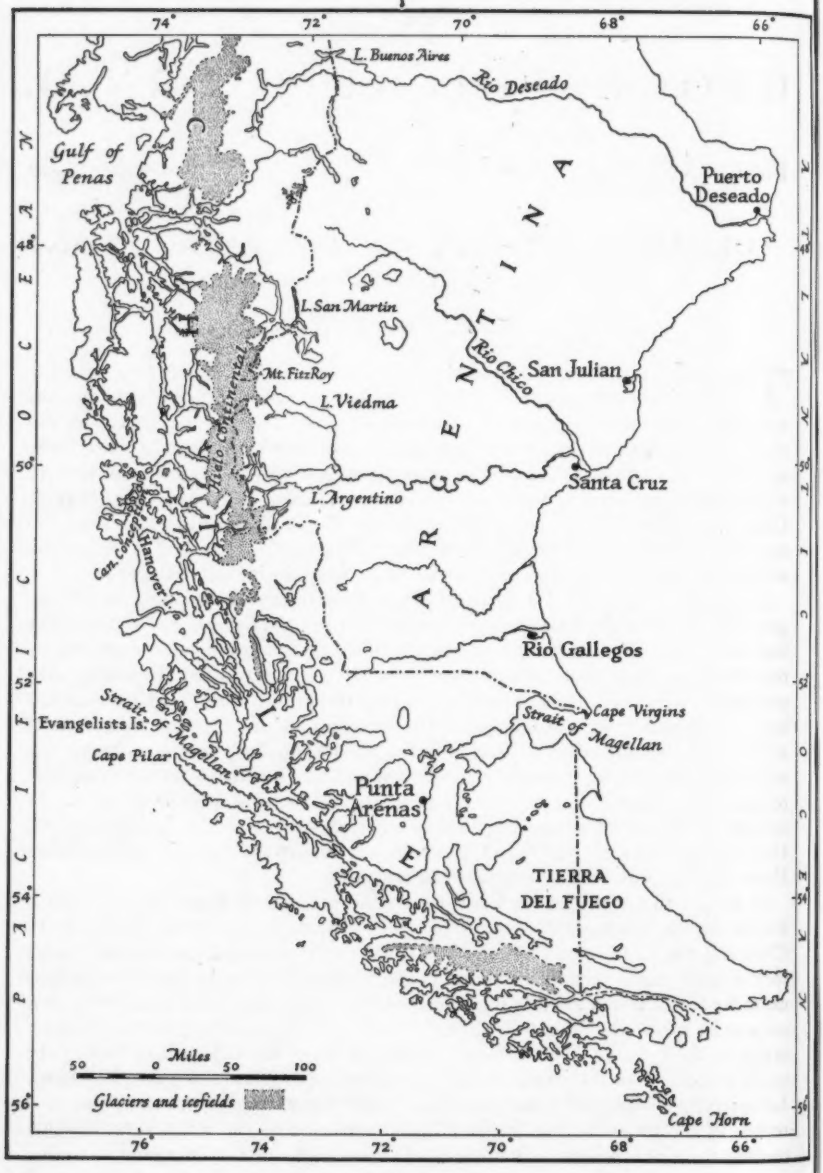

74°
72°
70°
68°
66°
L. Buenos Aires
Río Deseado
Gulf of Penas
Puerto Deseado
ARGENTINA
L. San Martin
Río Chico
San Julian
Mt. FitzRoy
L. Viedma
Hielo Continental
Santa Cruz
L. Argentino
Cam. Cuesta
Hanover I.
Rio Gallegos
Strait of Magellan
Evangelists Is.
Cape Pilar
Cape Virgins
Strait of Magellan
Punta Arenas
TIERRA DEL FUEGO
Miles
50 0 50 100
Glaciers and icefields
Cape Horn
PACIFIC OCEAN
ATLANTIC OCEAN
48°
50°
52°
54°
56°
76°

Figure 1

on the various glaciers radiating from the ice cap, which he identified as bands of volcanic ash. From a study of these and from other evidence he concluded that the main focus of these eruptions was situated about lat. 48° 50′ S., long. 73° 40′ W. He also suggested that there might be another vent to the south of Cerro Piramide.

During the course of our expedition in 1958–9, Bratt, Mercer and I reached the "Vulcan Viedma." We found that the outcrop was composed entirely of sedimentary and metamorphic rocks and that there was no sign whatever of any volcanic activity in the area. On the other hand, on our way there we found large quantities of pumice scattered over the surface of the Viedma Glacier, in a position corresponding to some of Lliboutry's "ash bands."

The original plan for my second expedition was to investigate the first area indicated by Lliboutry. I proposed to attempt to reach it from the head of the Brazo Oeste of Lago O'Higgins. Several valleys drained into this fjord from the west, and I hoped that at least one of them would afford access to the ice cap. A good deal of time and effort would no doubt be needed to find a way but, as the main obstacle to the exploration of any part of the ice cap is the violent wind that prevails, this route would have the advantage of involving the shortest distance to be travelled on the plateau while exposed to its full force. It is not possible to reach the Brazo Oeste overland, and it appeared that the only boat available on the Lago O'Higgins was extremely unreliable. However, I was fortunate enough to obtain from the War Office the loan of a large inflatable boat, a replica of that used by Dr. Bombard for his voyage across the Atlantic, manufactured by R.F.D. Co. Ltd. Also, the Seagull Company very kindly lent us two 4-horse-power outboard motors.

I invited Peter Miles to accompany me again. Though not a mountaineer, I had found that he was a very useful man to have on an expedition of this kind, and I hoped that, besides helping with the carrying of loads to the ice cap, he would be able to continue the zoological work he had done during the previous season. He had recently got married and I agreed to his request that his wife, Martha, should accompany him. I also invited W. Ellery Anderson to come with me, and he helped me to collect the necessary equipment in England and to arrange for its transport to Buenos Aires. Jack Ewer, of the University of Chile, and Peter Bruchhausen, of the Antarctic Institute of Argentina, completed the party, which assembled in Buenos Aires in the middle of December 1959. We travelled from there to Comodoro Rivadavia in a tanker, arriving at that port on the 26th.

Once again the Shell Company of Argentina gave us generous and invaluable help which solved our difficult problem of reaching Lago O'Higgins. Mr. de Wit, the Company's manager in Comodoro Rivadavia, entertained us there and provided us with three vehicles for the onward journey of some 600 miles. We started this at 6.30 a.m. on December 27 and, driving by way of San Julian and Tres Lagos, reached the shores of Fiordo Maipú of the lake at 3 p.m. on the 29th. The last 40 miles of the journey was over an extremely rough track. At the end of this, there was a small *estancia*, El Condor, whose owner, Señor Fernandes, received us with the same open-handed hospitality that one finds everywhere in Patagonia.

Before leaving Santiago, Ewer, with the cooperation of the Instituto Geográfico Militar, had made an exhaustive study of the air photographs of the ice cap taken by the American Air Force. He had found among them two pictures which had evidently escaped the notice of Professor Keller and Dr. Lliboutry, for they showed definite evidence of volcanic activity near the summit of the highest peak of a range named by de Agostini "Cordon Pio XI." This peak, which was called "Lautaro" by Lliboutry, lies almost in the centre of the ice cap just south of the 49th parallel, a position corresponding much more closely to the "volcanic cone" seen by

Reichert's party. In view of Ewer's discovery I had decided to approach the ice cap from the Brazo Sur, following Reichert's route. This change of plan altered the whole character of our task, for instead of finding a new route on to the ice cap and searching over a wide area of its untrodden northern part, we would be approaching by ways already traversed and aiming at a definite objective.

Unlike the Brazo Oeste, the Brazo Sur is accessible overland, so that our boat was no longer essential. However as, after a long series of storms, the weather had improved, and our hosts predicted a few calm days, and as sufficient pack animals were not available, we decided that Anderson, Bruchhausen and I should attempt the voyage taking with us the bulk of our baggage, while the others went overland. Having spent December 30 sorting and repacking our stores and equipment and in assembling and testing the boat and engines, we left El Condor on the morning of the 31st. The day was clear and still, and in this we were very lucky, for such weather is exceedingly rare in that part of the world. Instead of the long, cold struggle against powerful head-winds and drenching spray that we had anticipated, we found ourselves gliding over smooth water under a warm sun. In three hours we had cleared the network of narrow channels at the exit of Fiordo Maipú and entered the main lake. Gradually the panorama of ice mountains opened to the westward, clear except for some small white clouds that clung to the higher peaks. At about 4 o'clock we rounded a headland to the south-west and were confronted by a magnificent view of the O'Higgins Glacier sweeping up from its broad front of calving ice cliffs to its source in the Hielo Continental. Far away in the background we saw a mountain, which from its direction and distance we identified as Lautaro. It also had its white cloud, which at first appeared similar to the others; but watching it carefully we noticed that instead of floating idly about the summit it was in a state of some agitation and, several times before we lost sight of it, mounted swiftly to form a great mushroom-topped column. Could it be that our volcano had chosen this season to resume its activity?

There are two small farms at the narrow entrance to the Brazo Sur, and the arrival that evening of our tiny craft caused something of a sensation. The settlers in this remote corner of Patagonia came there from Puerto Natales on the coast of southern Chile nearly fifty years ago, making the long track to their unknown destination by way of El Calafate and Tres Lagos. They were obviously delighted to have visitors and received us with great kindness. A long ridge, well forested to a height of 3300 feet, separates the valley of the O'Higgins Glacier from that of the Brazo Sur; with the aid of pack-ponies hired from one of the farms we carried our baggage across this, and when the others arrived on January 4 we went up again to camp on a shelf overlooking the glacier, about 5 miles above its front. We had with us enough supplies to last us for about eight weeks. From here Anderson left us and returned overland to El Condor.

The O'Higgins Glacier is one of the largest flowing from the ice cap. Opposite the site of our first camp it is about $2\frac{1}{2}$ miles wide. But it is in a state of rapid decline. It now flows through a moraine trench (the top of which forms the shelf on which we had our first camp), between 800 and 1000 feet deep. The sides of this trench are completely devoid of vegetation, which shows that they have not long been exposed. One of the original settlers, who accompanied us to our first camp, told us that when he first came there in 1914 the surface of the glacier was almost level with the shelf. If this is true it means that the surface of the ice has sunk at least 700 feet in the last fifty years. Mrs. von Rensell Atkinson, who accompanied Dr. Reichert in 1933, has told me that then the descent from the shelf to the glacier was not more than 60 metres, say 200 feet. This suggests that the shrinkage has been far more

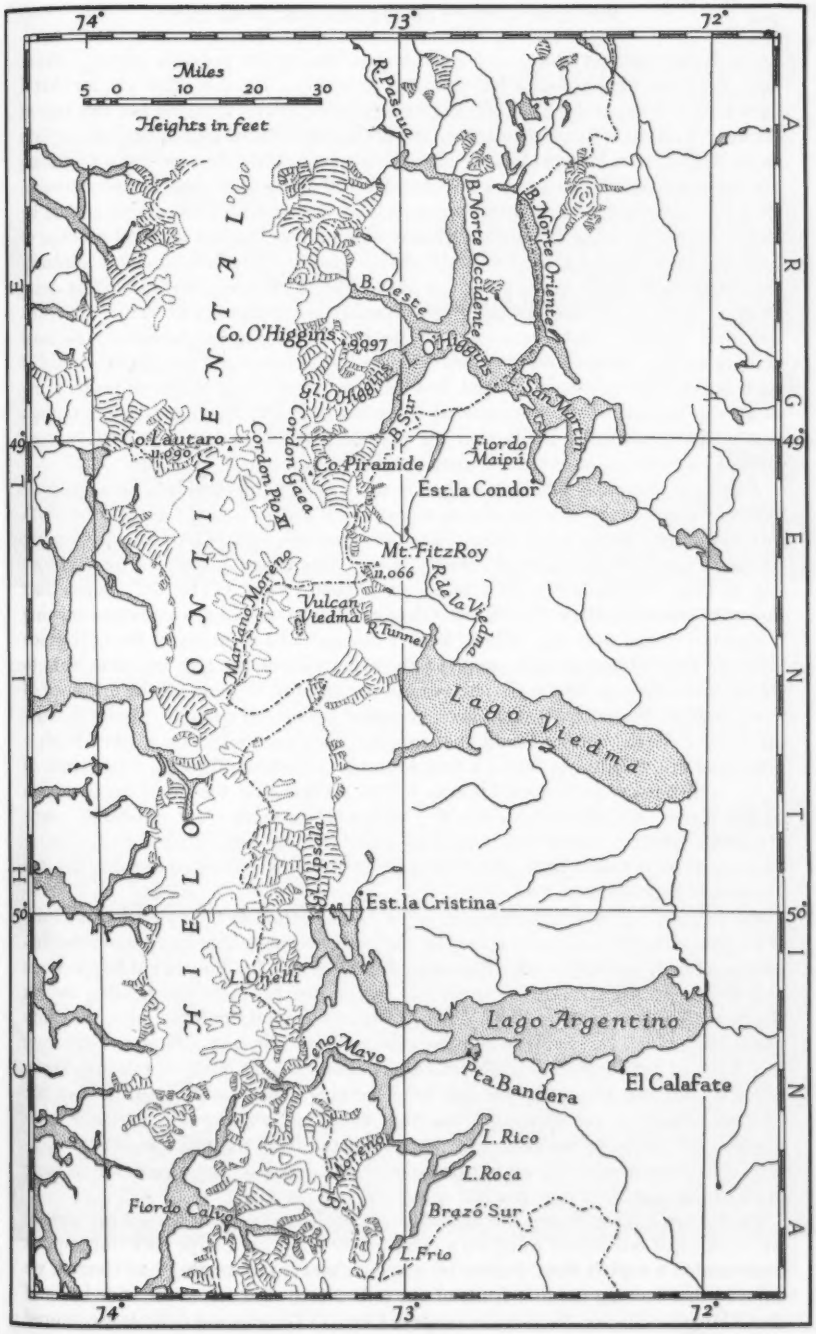

74°
73°
72°
Miles
5 0 10 20 30
Heights in feet
R. Pascua
B. Norte Occidente
B. Norte Oriente
B. Oeste
Co. O'Higgins 9997
O'Higgins
L. San Martin
Gl. O'Higgins
Co. Lautaro 11,090
Cordon Paso
Cordon Gaea
Co. Piramide
Fiordo Maipú
Est. la Condor
Mt. FitzRoy 11,066
R. de la Vieda
Mariano Moreno
Vulcan Viedma
R. Tunnel
Lago Viedma
Upsala
Est. la Cristina
I. O'Neill
Lago Argentino
Lago Mayo
Pta. Bandera
El Calafate
L. Rico
L. Roca
Moreno
Fiordo Calvo
Brazo Sur
L. Frio
49°
50°
ARGENTINA
CORDILLERA

Figure 2

rapid during the last twenty-seven years than during the previous twenty. Since 1933 the front of the glacier has retreated nearly 5 miles. No other glacier that I have seen in Patagonia (or elsewhere for that matter) shows anything like this rate of decline. This exceptional shrinkage of the O'Higgins Glacier is as difficult to explain as the fact that the Moreno Glacier has evidently not diminished appreciably during the last 200 years, while its neighbours have suffered a considerable net recession over the same period. Lliboutry suggests that this latter phenomenon might be explained by the shape of Moreno's basin which allows the unrestricted passage of the ice from the upper to the lower parts of the glacier. He admits that this explanation should also apply to the condition of the Viedma Glacier, whose basin is quite as open, but which has retreated considerably. He suggests, however, that this apparent anomaly might be accounted for by the melting of the ice by thermal activity centred around his "Vulcan Viedma." The evidence for the existence of such activity has now been refuted, but the suggestion might be worth considering as an explanation of the phenomenal recession of the O'Higgins Glacier, though this would presumably imply that the present phase of volcanic activity centred around Lautaro began not much more than fifty years ago.

From our first camp onwards we had to carry everything ourselves. We aimed at getting enough supplies to the ice cap to last us for a month; and this, together with our equipment, necessitated three relays between each succeeding camp. First, we had to descend 800 feet from the shelf into a curious bay of "dead" ice formed by a gap through which, a few decades ago, a portion of the O'Higgins Glacier had flowed to join a tributary of the Chico Glacier. This minor ice-stream is now making a vigorous thrust over the "dead" ice to form instead a tributary of the O'Higgins Glacier. Beyond our second camp, on the other side of the bay, we were able to follow along the edge of the glacier for a mile or so, until we reached the entrance of a side-valley. Formerly this had been occupied by a small tributary glacier flowing off Cordon Gaea, but we found that its place had been taken by a lake. With a good deal of difficulty we found a way round this obstacle, through a labyrinth of seracs and narrow ice ridges. It was in this section that the rapid degeneration of the glacier was most in evidence. Day-to-day changes were noticeable: new crevasses opening, ridges and pinnacles disintegrating and, after a fortnight, it became obvious that a large part of the ice over which our original route lay was about to collapse into the lake.

On January 14 we reached the site of our third camp, in the upper basin of the O'Higgins Glacier, and from there, on the 15th, we were able to reconnoitre forward to the edge of the ice cap. Returning from this task I fell into a hidden crevasse and dislocated my shoulder. Fortunately, while Bruchhausen was holding me on the rope, Ewer was able to reach down, grasp my arm and pull the joint back into place, after which I was able to help my companions in their endeavours to extricate me. I rested for three days while the others continued the work of relaying loads. Since leaving our first camp we had been working continuously regardless of the weather which, for the most part, was bad. Wind and soaking rain were our daily portion, but while on the glacier we were sheltered from the full force of the westerly gales, which we could see blowing over the ice cap and, though conditions were often unpleasant, they were not bad enough to stop us.

On January 19 we carried the last relay of loads to the edge of the ice cap, where we established our fourth camp on a comfortable ledge on a large rock outcrop. It commanded a superb view, and as, by a lucky chance, the weather had cleared, we enjoyed that evening the first-fruits of our toil. Northward across the wide basin of the O'Higgins Glacier, the massive range of Cerro O'Higgins was delicately coloured

Cerro O'Higgins from the third camp across the O'Higgins Glacier

The front of the Moreno Glacier, March 1960

An original settler on the shores of the Brazo Sur

Doña Carmen, our hostess at a settlement on the Brazo Sur

in the golden twilight, looking with its remote summits, its armoury of hanging glaciers, as impressive as any Himalayan giant. To the north-west, a vast sweep of level ice stretched away to some unexplored ranges, and to a gently curved saddle, rimmed with a line of deep blue which gave the impression that we were looking over to the Pacific. But, for us, the most exciting sector of the view was to the west, where the Cordon Pio XI rose steeply above the plateau to a long line of peaks, silhouetted against the gaudy sunset sky. About 300 feet below the summit of the highest of them (Lautaro), the ice slope on the northern side was gashed by a black fissure, from which there flowed a steady stream of vapour, mounting vertically for several hundred feet, then to be carried away by a southerly air-current.

The next day we set off on skis westward across the plateau to lay a dump of three weeks' supplies. Soon after we had started we saw an eruption of ash from the volcano which blackened the snow over a large area of the mountainside. The weather held and we made excellent progress, reaching a point more than half way across the plateau to the foot of the volcano, where we laid the dump; but we were all very tired when we arrived back at camp late in the evening. The following morning was again clear, though there were distinct signs that the fine spell was about to end. I was most anxious that we should carry our camp forward to the dump without delay, because I was afraid that a heavy fall of snow or drift might bury the dump and, although we had done our best to fix its position by compass bearings, it would, in any case, be very difficult to find in thick weather. Also, we had left ourselves rather short of food at our present camp. However, though we prepared for an early start, it was obvious that most of the party were badly in need of a rest, particularly Bruchhausen who had lately developed a bad foot which was becoming increasingly painful. So I decided to take a chance on the weather and give the party its first off-day.

That night the weather broke and for the next four days the violence of the wind and driving sleet made it impossible to venture out on to the plateau. On the fifth day the storm abated somewhat, and we struck camp and set off in the afternoon, hoping to reach the dump by nightfall. But Bruchhausen found that, despite the enforced rest, his foot was worse; skiing caused him such acute pain that it was soon clear that it was useless for him to attempt to come any further. Reluctantly we decided that the wisest course was to send him back, so that evening Ewer and I started to escort him down the glacier. We accompanied him as far as our first camp in the forest, where there was plenty of food, and from there he made his way slowly back to the settlement on the Brazo Sur. His departure was very sad both for us and for him, particularly as he had taken his full share of the toil of the past few weeks. It was a bad blow to our prospects on the ice cap, for the mountaineering strength of the party, already depleted, was now seriously weakened. It had never been intended that Peter and Martha Miles should play a major part in the work on the ice cap; indeed, it was only the radical change of plan made at the outset, and their keen desire to get there, which had led to their taking a full share in the work of reaching it, a task they bore with admirable fortitude. But they were not mountaineers, and though this fact made their performance still more remarkable, it now meant that our plans would have to be curtailed.

After some forced marches, Ewer and I rejoined them at the fourth camp and were just in time to take advantage of another brief spell of clear weather. In this we made our way across the plateau to a nunatak at the foot of the volcano where, with supplies relayed forward from the dump, we established a well-stocked base, about half-way between Lago O'Higgins and Fiordo Eyre on the Pacific coast. For the next fortnight the weather was very bad with heavy rain, some snowstorms, and incessant

wind, with occasional gusts of extreme violence. In one of these, two pairs of skis were blown away and not seen again. The camp was protected by a rock cliff from the full force of the wind, though this had the minor disadvantage that when it snowed the tents were buried in drift. One night a pond, 2 feet deep, formed on the hollow platform occupied by the Miles's tent. Nothing could be done to drain it, so they brought their sodden sleeping bags into our tent (designed for two) where we remained tightly packed until, thirty-six hours later, a lull in the weather enabled us to extricate their flooded tent and construct another platform for it. But three nights later they were in trouble again. A violent gust from an unexpected quarter tore their tent from its moorings, snapped most of the guy-ropes and broke one of its poles. Once again they were forced to accept our meagre hospitality for two nights until the damage could be repaired. Meanwhile we were experiencing trouble with our two pressure stoves. The fuel pipes became blocked, partly by volcanic ash, and partly by lead in the petrol, and because of a faulty design in the stoves, we could not free them. At length they ceased to function altogether, and thereafter we had to subsist on uncooked food and cold drinks. Fortunately we did not have to melt snow to obtain water, of which there was an ample supply on the nunatak.

Besides the short ski tours which we did in the vicinity of the volcano, we had hoped to make a longer journey from our nunatak base into the unexplored northern part of the ice cap. But it seemed that in the circumstances such an expedition would be beyond our capacity and I decided to limit our objective to making a collection of rocks from such outcrops on the mountain as we could reach. In this we were helped by one brief spell of fine weather.

Despite a few minor mishaps, our journey back was uneventful and increasingly pleasant, and we reached El Condor (again by boat) towards the end of February. From there we went on to the coast where I parted from my companions, who were homeward bound, and went on to renew my acquaintance with the glaciers of Lago Argentino.

The achievements of the expedition had fallen somewhat short of my hopes. True, we had established beyond all doubt the existence and position of the mysterious volcano, thanks largely to the timely circumstance of its renewed activity; and we had collected enough material to learn something of its structure. But with less miscalculation and a little more luck, we should have made much better use of a month's supplies carried to the ice cap with so much toil. There is still a great deal to discover about this strange region and there is much to learn about the peculiar problems of travel that it presents. It is one of the most fascinating regions I know, though it certainly demands of its votaries some measure of stoicism.

ASPECTS OF AGRICULTURE AND SETTLEMENT IN PERU

C. T. SMITH

BY MEANS of three sample studies* this paper seeks to discuss several themes which are generally accepted to be of considerable importance in the human geography of Peru: the use of scarce water resources on the arid coast and in the southern Andes; the way in which land-holding practices are integrated with the use which is made of land; and the extent to which traditional land use has been altered by recent changes towards a commercial economy. The areas discussed are a large sugar estate at Paramonga, north of Lima, and the irrigated areas of the Ica valley and the Arequipa basin (Fig. 1: general map).

The tendency of agriculture in the Peruvian coastal oases towards monoculture of export crops is well known. With a few exceptions regional specialization in cotton, sugar and rice is very well marked. The Chicama valley, for example, has about 65 per cent. of its cultivated area devoted to sugar alone; over 80 per cent. of the Ica valley is in cotton. In 1954–6 cotton and sugar contributed 40 per cent. of total exports, though it is not always realized that a substantial proportion of both products is retained within the country—about a third of the sugar production and the greater part of the cotton seed oil and cake, together with about 12–13 per cent. of the cotton fibre. Slightly more than a half of the national consumption of coarse paper is a by-product of sugar production.

The sugar cultivation of northern Peru makes its own distinctive contribution to the landscape and is closely related to the nature of the physical environment, but the chain of circumstance which gives individuality to the coast of northern Peru does not end with the concentration on sugar. There are, in general, differences in the size of unit of operation, in settlement patterns, and in social problems between the sugar areas and the rest.

Paramonga.—The sugar estate of Grace Brothers at Paramonga, about 120 miles north of Lima, occupies over half the irrigated land in the lower valleys of the Pativilca and Fortaleza rivers. Some 10,500 of its 17,000 acres are devoted to sugar and about 3000 to other food crops, partly because Peruvian law requires a minimum proportion of land to be used for domestic food crops. Maize and alfalfa for dairy stock are the major subsidiary crops. Sugar production is efficiently managed to produce high yields of about 69 tons per acre with new varieties, such as CH 32 and 37, bred in Peru from Hawaiian stock. Output on roughly the same area has increased from 230,000 tons before 1944 to some 474,000 tons in recent years. The growth cycle is approximately eighteen months and since the cane is allowed to ratoon from three to seven times, though not usually more than five, land is under cane from five to eleven years before it is cleared and sown, usually for two years with beans, which are ploughed in green in order to increase organic and nitrogen content in the soil, supplementing heavy application of guano and other fertilizers.

* This paper has arisen out of reconnaissance studies in Peru in 1957 made possible by a grant from UNESCO, and assistance from Cambridge University. I should hereby like to acknowledge the help and hospitality accorded to me by Peruvian geographers at the University of San Marcos, and at the University of Arequipa; by the Ministerio de Agricultura and the Servicio Cooperativo Interamericano de Productos Alimentos, and also by the British Council in Peru.

Relief and soil facilitate efficient irrigation. Irrigable land is confined to the convergent alluvial fans of the Pativilca and Fortaleza rivers, for elsewhere the intricately dissected foothills of the Andes reach the sea. The last major movement of the coast has been one of submergence,[1] and rivers are slightly incised into the alluvial deposits, which are naturally well drained. A gentle surface gradient of about 4 feet per 1000 facilitates irrigation and drainage. Soils are silty and retentive of water near the coast, grading inland to less valued sandy, stony and gravelly soils. Water supply presents few problems. The Fortaleza is typical of many streams which rise on the western flanks of the Andes in that it is fed only by seasonal rainfall and is dry

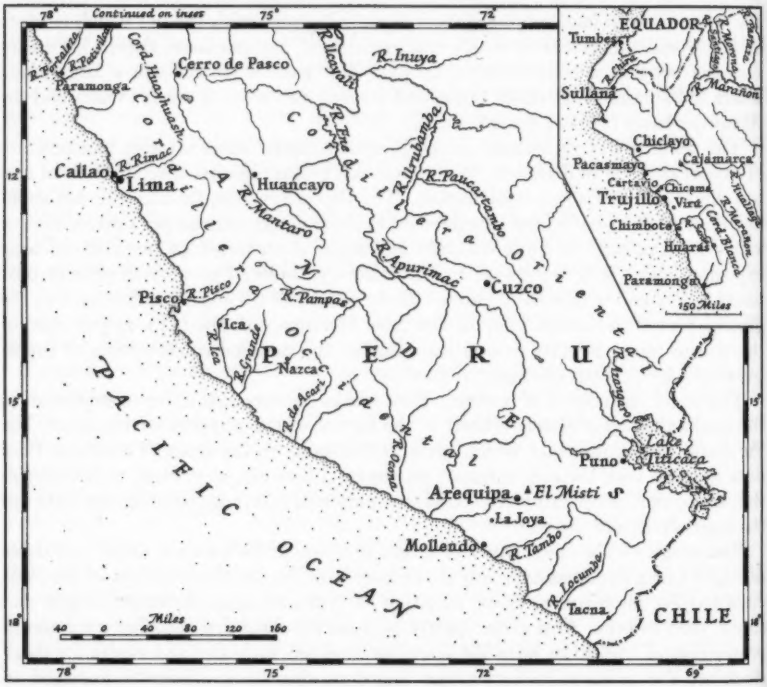


Figure 1

during the winter months. The Pativilca, however, rises further east in the northern section of the wetter and higher Cordillera Huayhuash and, like the Rio Santa and the Rimac, is fed in part by snowfields and glacial melt-water.[2] There is, therefore, a constant flow throughout the year (mean, 1940–56: 47·7 cu.m. per sec.). It is in spate from January to April (mean monthly maximum 227·8 cu.m. per sec., occurring in March), but the mean winter flow (mean monthly minimum 12·43 cu.m. per sec.) is higher than that of other streams on the coast with the exceptions of the pluvial regime of the Tumbes, much farther north near the Ecuador boundary, and the R. Santa, which drains the snowfields and glaciers of the Cordillera Blanca. At Paramonga, therefore, irrigation is possible throughout the year without recourse to tube-wells, which play an important role in sugar production farther north in the

Arequipa: irrigated terrace cultivation near Sabandia. Top left, Cerro Colorado

Arequipa: El Misti from the parish church of Caima

Chicama area. Potentially irrigable land is short, but the abundant supplies of the Pativilca are important in two ways. Water is carried over the Fortaleza to irrigate its right bank, and surplus water has been of considerable significance in the establishment of paper and chemical plants as well as the refining of sugar. It seems possible that the water supplies of the Pativilca could be used in further industrialization, as those of the Rio Santa already are in relation to the iron and steel industry of Chimbote.[3]

The combination of an all the year round growing season and abundant irrigation water makes it possible to rotate sugar cultivation so that a constant supply of ripe cane is available for refining. Detailed control of irrigation is obviously necessary to ensure differential ripening, involving an elaborate system of cement-lined canals and careful drainage. On this basis the sugar mill can be kept operating throughout the year, except for a brief period of a few weeks when the mill is closed down for repairs and maintenance. But rotation of sugar harvests means that a sugar mill can deal with the production of cane from a much larger area than where it is grown under seasonal conditions. This may be one of the factors, though probably not the most important, which has encouraged the trend over the last fifty years towards larger estates. Rotation of sugar harvests was already practised in 1900, when the normal practice was for sugar mills to be in separate hands from the cultivation of the crop.[4] The integration of sugar mill with plantation, and the growth of the very large estate, is a recent trend, according to Romero, of the inter-war period, and was associated with large-scale foreign investment.[5] The Paramonga estate results from the amalgamation of four plantations at the end of the nineteenth century, acquired by Grace in 1927; the Grace estate at Cartavio further north results from the amalgamation of twenty units, and the enormous estate of the Gildermeisters in the Chicama valley is a product of the amalgamation of rather more than sixty.[6] A few very large estates, feeding only fifteen mills, supply by far the greater part of the Peruvian production of sugar and almost all of the exports.

From the nineteenth century, first with slaves, then with Chinese indentured labour imported during the sugar boom of the 1870's, and later Indian labour from the sierra under contract (the *enganche* system), many of the haciendas have inherited a tradition of close supervision of their labourers, who are grouped in communities around the sugar mill and the headquarters of the hacienda. Paramonga, however, is more than a plantation settlement, for it has grown to the size of a small town. In the census of 1940 it is recorded as having 4985 people; its population now is estimated at 9500, out of a total of 10,500 estimated to be dependent on the estate. Of these, 3800 are employed by the Company. Employment figures are high, not only because of the heavy unskilled labour of planting and harvesting the cane, which still occupies much temporary Indian labour from Huarás, but also because of the industrial complex which has grown up round the production of sugar since the period of war-time and post-war shortages, and which is concerned with the production of paper from bagasse, caustic soda, chlorine and industrial alcohol.

In this new town of Paramonga one is aware of two sets of problems, one social, the other to do with physical planning. The latter can be summed up very briefly. The town has grown up and is still growing on the best soils of the estate. The fine silts near the coast, normally associated with the best yields, are being sterilized by new building. Company policy encourages the building of new hamlets for field workers at the inner margins of the estate and of the irrigated land, where soils are stony, sandy and patchy in quality. The social problems are to some extent a product of the very successful welfare policy pursued by the Company towards its employees. Money wages are good and employees are supplied also with subsidized

Arequipa: El Misti from the parish church of Caima

or even free food, clothing and housing. The Company provides many services which are normally the responsibility of local government—water, sanitation, street maintenance, electricity, schools and recreational facilities. In many ways, Paramonga is a model town. Its houses are more substantial than those to be seen in many coastal settlements. Streets are in better condition, with either asphalt or molasses-bound surfaces which do much to reduce the all-pervading dust. People are better dressed, better cared for spiritually and medically; they are better fed and healthier. Nevertheless, there are many causes of friction and difficulty, arising often out of matters which elsewhere would be regarded as the affair of local government. The Company's position may perhaps be summed up in a quotation from one of their publications. "Community management with all the social and political problems involved is at best an unenviable chore. The only complete solution would be to get out of the community business, but this seems impossible at least in the foreseeable future."[7] Meanwhile, some problems are arising which threaten to become urgent. The population of the town is increasing rapidly, although there is little expansion of employment by the Company. Men employed on the estate bring down their families, perhaps from the sierra. Housing is becoming overcrowded. Unemployment or under-employment appears, not only with the immigration of male relatives, but also with the appearance of a second generation of young men who are seeking work which is not always available. Some at least of the surplus population is not inclined to move, for they have good housing and participate indirectly in some of the benefits supplied by the Company.

The problems of Paramonga are those of a company town. Industrial relations are good, standards of living relatively high, the production of sugar very efficiently organized. Yet there remain the problems of a town almost completely dependent on one enterprise on whose land and by whose initiative the town was created.

The Ica valley.—The landscape and the problems of the Ica valley present a very great contrast with those of Paramonga. Techniques of cultivation vary from the ox-drawn plough to a high degree of mechanization, and it is impossible to equate techniques with size of holdings because of the tendency to divide large haciendas into small tenancies on a crop-sharing basis. The difference in land use is most striking, since no less than 81·8 per cent. of the cultivated area was in cotton in 1956. The viticulture of the Ica valley has had a national reputation since early colonial days for wines and for the brandy marketed under the name of Pisco, the port for the area. But vines occupied only 6 per cent. of the area cultivated in 1956. The major remaining crops are maize, pallares beans and alfalfa. Associated with the pattern of land use are two elements which appear to dominate the character of the area; the problem of water and the distribution of land holdings.

The problem of water is associated with three characteristics. The regime of the river is highly seasonal. Rising in the relatively dry western cordillera at about 15,000 feet, fed by rainfall and serving a smaller catchment area than the Pativilca, the Ica river has a marked maximum in January, February and March, but for the remainder of the year it is dry, or nearly so. Secondly, a permanent water-table, fluctuating seasonally but with its highest level in June and July at Ica, lies within access of the surface over much of the potentially irrigable land in the middle valley of the river, and also in the valley of the Rio Seco to the north. Lopez de Velasco noted in 1574 that "The river flows beneath the sand."[8] In the late nineteenth century domestic wells tapped a water-table at 10–15 feet below the town of Ica,[9] though now this would no longer be possible. The middle Ica flows over Miocene marine sediments before cutting through the igneous rocks of the Tablazo de Ica in a gorge section, and the relatively high water-table is held up by mudstones

and siltstones below the superficial deposits of sands, silts and gravels which mantle the valley. Thirdly, soils are potentially fertile, lacking organic matter, but with a satisfactory content of potash, phosphates and lime. Soils to the west are predominantly sandy and therefore highly permeable. At Macacona, for example, the sand fraction is 72 per cent. Silts tend to occur mainly towards the east and south. But there is much local variation. The physical characteristics of soil distribution appear to be a product partly of the gradation from coarse gravels to sands and silts down the valley, partly of mass movement of material ranging from silts to gravels in the alluvial apron below the western cordillera, and partly of wind-blown deposits deriving from the west, which are best seen in the magnificent dune complexes of the surrounding area.

Seasonal water shortage and the use of the shallow water-table have dominated the history of land use in the Ica valley since colonial times and before. The groves of algarrobo trees (*Prosopis juliflora*) south of the town of Ica, once the chief reflection of an accessible water-table, were a valuable source of pasture, charcoal and fuel, especially for the coarse pottery made locally to carry wine and brandy. Vasquez de Espinosa wrote in 1628, "One finds extensive woods of guarangos or algarobbos, impenetrable at many points. Much cattle roam about in them, with goats, hogs and sheep, or llamas, as well as many savage wild animals. They live on the beans which fall from the trees, and their meat is excellent and well-flavoured. On the Nazca road there are five leagues of woods, so thick that the highway is the only way to get through them."[10] Even at the end of the eighteenth century there were still "woods of algarobbos whose fruit raises beasts of burden and the burros which are sold outside the region."[11] Only a few traces of this vegetation remain, and these are still exploited for charcoal. In some areas, especially near Villacuri, shallow depressions had been excavated down to the water table in pre-Conquest times. The "sinks" of Villacuri, as they were called, excited the interest of colonial travellers: "They dig away the shifting sand, sometimes to the height or to twice the height of a man, until they reach the water. Sowing is done by making holes with thick stakes, into which they put the heads of fish together with two or three grains of maize."[12] Others noted the application of this system to viticulture.[13] Many of these sinks may still be seen, here and elsewhere along the coast, though no longer used for cultivation. It has been suggested that similar features in the Virú valley reflect the breakdown of large-scale irrigation systems before the Inca Conquest.[14]

The preoccupation with water can be traced to the Inca period in the legend associated with the cutting of the La Achirana canal to the east of the river Ica. It still takes the first and the last of the irrigation waters from the main river, and was reputed to have been dug by the army of Pachacutec shortly after the conquest of the area for the Inca Empire. Since 1886, proposals to increase water supply and reduce dependence on the highly seasonal regime have turned upon the possibility of diverting the Atlantic-flowing waters of Lake Chocloccocha towards the upper waters of the Ica. The project was revived in 1946, abandoned in 1952, restarted in 1955 and, after some difficulties due to shifting sands and poor transport, the five tunnels and thirty-three miles of canals were completed in November 1959.[15] It is anticipated that adequate water will be available to irrigate 60,000 acres of land.

Irrigation and land use are finely adjusted to the availability of water. Haciendas in the upper valleys irrigating by canal are in the most favoured position, with rights to a given number of days' irrigation a month or week. In the past, the upper haciendas could command sufficient water for sugar. Now, cotton, vines, alfalfa and even bananas at the edges of the fields are the chief crops. In the middle and lower valley, irrigation from floods between January and the end of March were the major

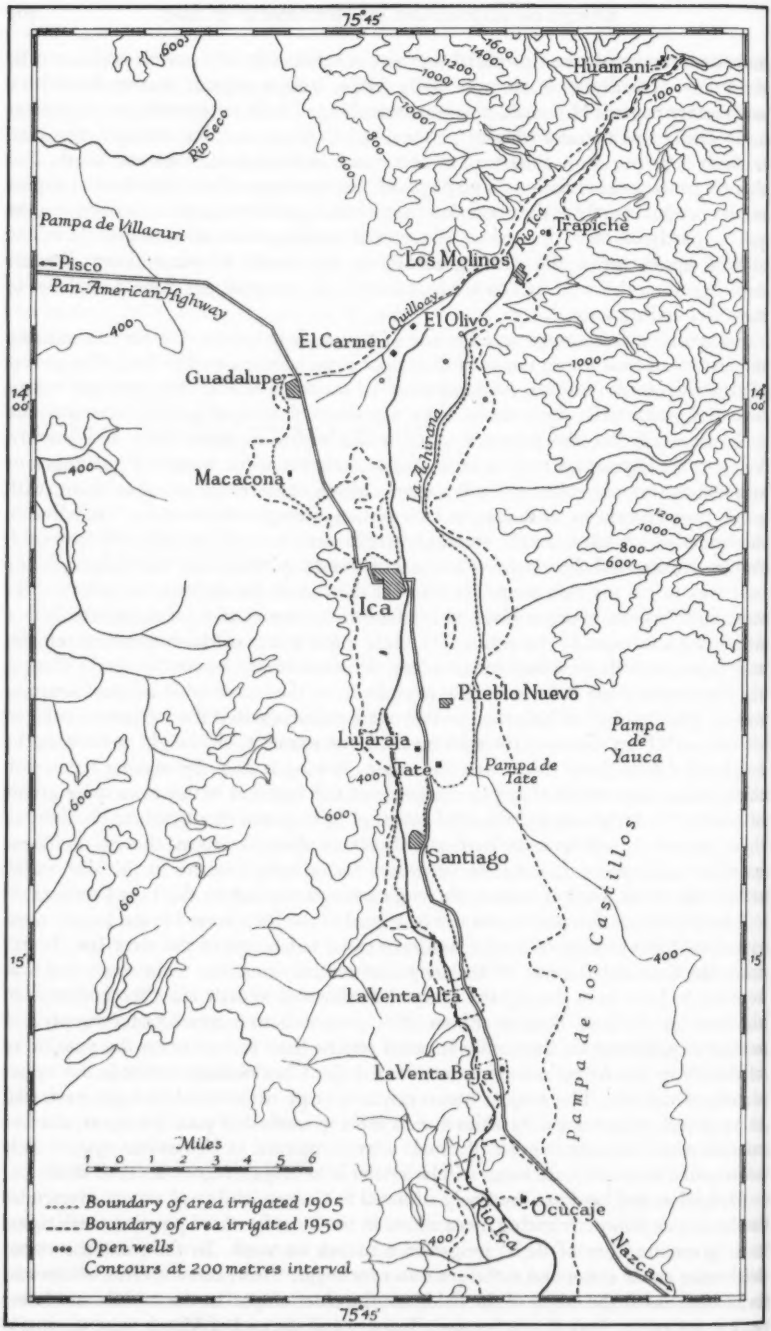


Fig. 2. The Ica valley

source of water, permitting only two or three very heavy waterings a year. Plots of approximately 40 yards square, enclosed by low earthen banks to facilitate complete inundation, are characteristic of this traditional system, which is still occasionally practised.

The spread of the tube-well since 1900 has modified traditional practice, permitted a rapid extension of the cultivated area from 47,000 acres in 1905 to 75,000 in 1956 (see Fig. 2), and also created new problems. From the single tube-well at Macacona in 1900, significantly on the margin of irrigated land, the number of tube-wells increased slowly to forty-nine by 1938, eighty in 1944, and then rapidly to 476 by 1956. Changes in land use have accompanied this expansion. Since the early twentieth century cotton cultivation has moved rapidly ahead at the expense of viticulture. In 1918, 17,400 acres, or 28·7 per cent. of the area cultivated, were under vines, compared with 3456 acres in 1956, and the area is still declining. Weak demand and low prices have tended to drive out vines in favour of cotton, the boom crop since 1945, but more efficient water control is one of the factors which has made this possible.

Recent expansion has been of quite contrasting types. South-east of Ica, notably in the Pampa de los Castillos, highly capitalized firms have entered into agreement with the State, by which they are granted 80 per cent. of new land brought under cultivation by irrigation from tube-wells, a practice widely adopted along the coast to encourage new extension of cultivation. At Ica, some of this newly irrigated land is retained by the irrigating firm for cultivation by efficient large-scale methods, and some is sold. The State's share of 20 per cent. is to be divided among small proprietors. About 200 diesel-driven tube-wells have been sunk in the last few years by one firm alone to depths of up to 300 feet, with yields at an average rate of 3 litres per second, though yields are very variable. In this area on moderate or large holdings, new land is divided into large, fenced fields, irrigated by means of cement-lined canals, usually planted with alfalfa for two years or so and ploughed in green, before cotton cultivation is begun. Farming methods are highly mechanized.

In the Pampa de Villacuri to the north, the water-table can be tapped by fairly shallow wells a few yards deep. This is the zone of small cultivators, some independent, other operating with loans from larger landowners either of cash or equipment in return for a proportion of the crop or a fixed sum. Each pioneer has his own well, builds a crude shelter of reed and adobe near it, digs irrigation ditches and begins to cultivate what he can of his claimed area. Maize and alfalfa in small plots, together with vegetables, water-melons and the like, are characteristic, but too often cotton is the first crop on newly irrigated land, yielding miserably for the first few years at least. In the Pampa de Villacuri particularly, water is sometimes excessively saline and UNESCO experts are engaged in a study of excess boron.[16] Disputes arise over questions of land title. To the south-east, problems are arising through a general lowering of the water-table. Precise information seems to be lacking, but wells of the traditional type are reported as having lower levels than formerly, and some are said to have dried up completely.

The distribution of land holdings is one of the major elements giving a distinctive character to the area, even though large and small holders are usually faithful to cotton, and large holdings are frequently rented out into small tenancies. The Ica valley has been characterized as a zone of small proprietors[17] and it is indeed true that 94 per cent. of all landowners have less than 17 acres. In terms of the distribution of area held, however, 46 per cent. of the area cultivated in 1940 (excluding the zone irrigated from La Achirana canal) was held in estates of over 1096 acres, 68 per cent. in estates of over 274 acres and 82 per cent. in units of over 68 acres (see

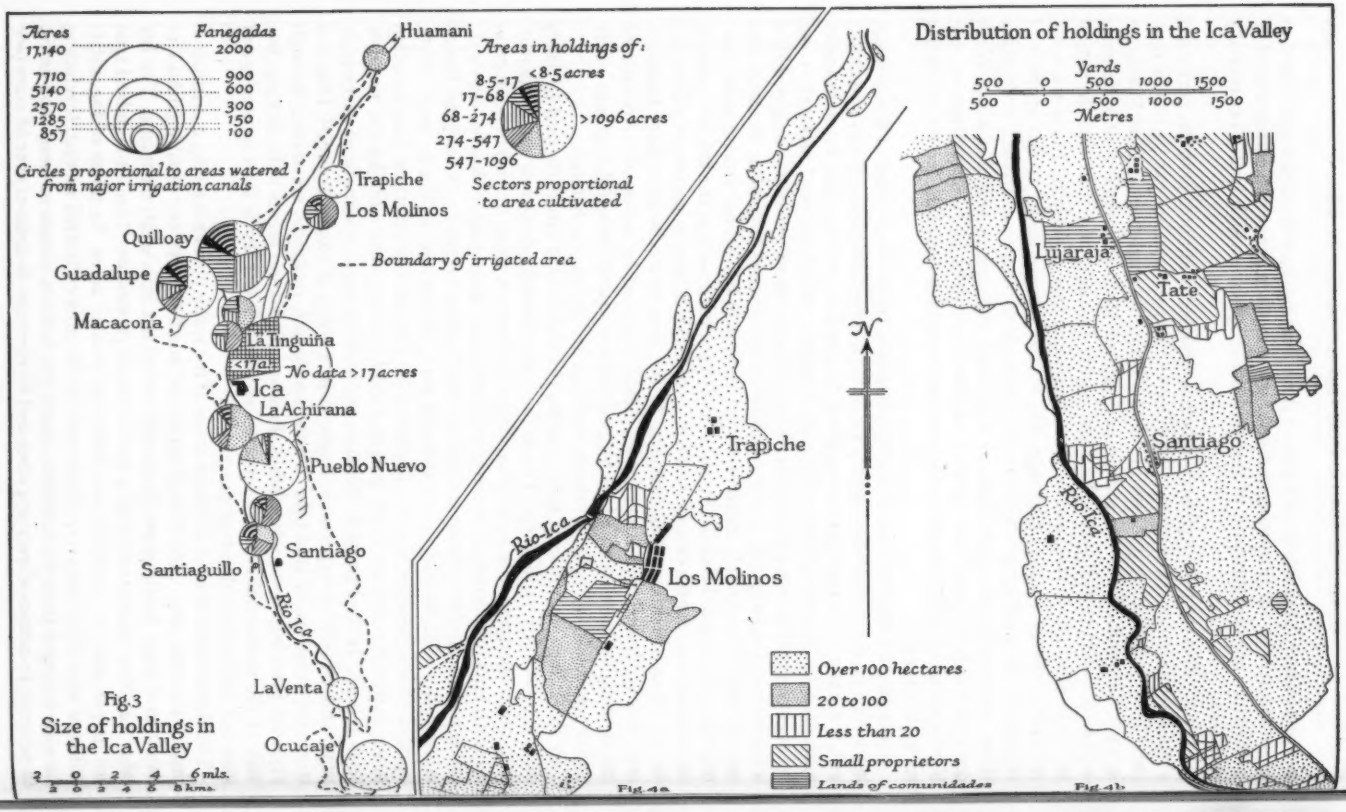

Acres
Fanegadas
17,140
2000
7710
900
5140
600
2570
300
1285
150
857
100
Circles proportional to areas watered from major irrigation canals
Areas in holdings of:
8·5-17
17-68
68-274
274-547
547-1096
<8·5 acres
>1096 acres
Sectors proportional to area cultivated
Huamani
Trapiche
Los Molinos
Quilloay
Guadalupe
Macacona
La Inguiña
Ica
La Achirana
Pueblo Nuevo
Santiago
Santiaguillo
Rio Ica
La Venta
Ocucaje
Boundary of irrigated area
<17 ac
No data >17 acres
2 0 2 4 6 mls.
2 0 2 4 6 kms.
Fig.3
Size of holdings in the Ica Valley
Distribution of holdings in the Ica Valley
Yards
500 0 500 1000 1500
500 0 500 1000 1500
Metres
Lujaraja
Tate
Santiago
Rio Ica
Trapiche
Los Molinos
Rio Ica
N
Over 100 hectares
20 to 100
Less than 20
Small proprietors
Lands of comunidades
Fig.4a
Fig.4b

Fig. 3). Only 16 per cent. of the area was in the hands of small proprietors with less than 17 acres. In Ica it is true, as Ford comments, "For the coast as a whole there are a great many small holdings . . . and relatively few large farms that make up the bulk of the total acreage." "The moderate-size family farm is notably absent."[18] Large haciendas predominate in the upper and lower extremes of the valley and in the west. Medium proprietors with 17–274 acres tend to have their greatest share in the middle valley near Ica, but the most striking feature is, perhaps, the high percentage of small holders along the most famous of the pre-Conquest canals, La Achirana (27·6 per cent.). This may be illustrated in two parts of the valley in detail (see Figs. 4a and b).

The general pattern of land holding is of long standing. A terrier of the valley made in 1645[19] records the survival of Indian communities at Anan, Luren and Tacaraca, to which many Indians had migrated from a nearby reduction. Spaniards held most of the land above Los Molinos, including the uppermost hacienda of Huamani, though there were some Indian lands. This area is still in large estates. Below Los Molinos, where one Spaniard had some 340 acres, were lands along La Achirana which were held by Indians in *comunidades*, and this is still the major zone of small holdings, with a few villages registered as *comunidades*. Spaniards and natural Indians held along the Quilloay canal, which now has 19 per cent. of its irrigated land in small holdings. The estate of La Venta was already occupied, but there was much more waste than now in the middle valley south of Ica, where occupation and cultivation must have occurred chiefly in the nineteenth century, if Cosme Bueno and others are to be believed on the state of the vegetation in the area in the late eighteenth century.

The *comunidades* still tend to be distinct from the regularly planned and ordered villages like Guadalupe or Los Molinos. Settlements are loosely nucleated and unplanned and land holding is very fragmented. At Tate, for example, only 8 out of 156 land holders had over 17 acres and 84 had less than 2. Plots are small and carefully enclosed by banks for the retention of irrigation water, and are devoted to fruit trees, often of indigenous varieties, beans, yuca and maize as well as vines and cotton. An open well, a wine press and a few head of stock may complete the picture.

Arequipa.—At 8000 feet between the coast and the High Andes, Arequipa shares characteristics of both. With only 4·4 inches of rainfall, concentrated in January, February and March, irrigation is as much a necessity as it is on the coast, though altitude is too high to allow the area to compete in the production of the coastal staples. Within the irrigated district of Arequipa, land is predominantly in small owner-occupied properties. In 1950, according to Ford, 84·6 per cent. of the area was in holdings of less than 43 acres and the average holding was about 5·5 acres.[20] This situation *per se* is not unique in Peru, since sample studies in the Huancayo basin, for example, show a predominance of small independent farms not nearly so tiny as the minifundia of much of the sierra. Combined with this emphasis on small-scale farming, however, there is a very dense rural population (½ acre per head of irrigated land in 1956) and a stable, apparently prosperous and very productive, agriculture.

The features associated with this fortunate state of affairs are complex, but a few of the most obviously relevant factors may be reviewed. The climate is one of fairly high diurnal range of temperature, high insolation, and relatively few night frosts (mean minimum, July, 37° F). Water supply is from the river Chili which drains the snowfields of volcanic peaks and is thus assured of a constant winter flow at an average of 4–6 cu.m. per sec. from April to December, with a marked seasonal maximum in February and March, coinciding with the rainy season. There is water

for the town, its industries and the 20,000 acres under irrigation. There are limited possibilities of expansion of the irrigated area in the immediately surrounding area, since level land is hemmed in by the lower slopes of El Misti, the Cerro Colorado to the south-west, and bad-lands developed in easily eroded rhyolitic tuffs, or sillar, to the north.[21] To the south of Arequipa, the area under irrigation has clearly contracted, for there are zones in which old shallow terraces are discernible on land which is now unirrigated because of excessive salinity, due probably to a long-term neglect of drainage. These zones are shown in Figure 5.

Nevertheless, water control is well developed at a fairly low level of technology. There is a close network of irrigation channels, though seepage losses occur from them since they are unlined. Small reservoirs on farmsteads store water against deficiency in supplies from the river. Terrace systems are carefully preserved and are said to be of Inca origin. They do indeed bear witness to a lavish expense of labour and possess a rectilinearity characteristic of Inca work elsewhere. Wash-outs occasionally occur on steep slopes. The frequency of irrigations may be as great as 1 day in 8 near the river Chili, and are normally between 1 in 8 and 1 in 16, but in a dry year such as 1956 water shortage may be serious. Thus at one village (Characato) most farmers had water only 1 day in 34 or 35, and at Paucarpata it was claimed that three-quarters of the farmers had to leave up to 60 per cent. of their lands out of cultivation because of a lack of water. The situation is changing, however. The water supply is being regularized by the building of two dams at El Fraile on a tributary of the river Chili to the north-east of El Misti. They are also intended to supply water to some 37,000 acres on the open pampa south of Arequipa, and to irrigate more effectively the lands at La Joya where irrigation projects were considered as early as 1828 and which were partly irrigated by a diversion canal from the main river in 1943.

The present orientation of farming is towards wheat and milk production, the former for local and sierra markets, the latter associated with the establishment of a factory producing evaporated and condensed milk for the Peruvian market. Even small farmers may have four or five *criollo* cattle, and many have turned to high-yielding Holstein cattle. The basis of farming is normally the production of wheat and maize in rotation with a short ley of two to three years of alfalfa. Maize serves for local consumption, and maize stalks are fed to cattle. There are a number of agrarian problems apart from water shortages: the invasion of alfalfa fields by *kikuyo* grass; the low milk yields of only 10–15 litres a day, due to excessive concentration on an alfalfa diet; declining wheat yields due to a degeneration of local varieties, and occasional losses due to frost. But in general the system of mixed farming that has been evolved appears well adjusted to a peasant economy and to local conditions of climate, water and soil. Two facts may be noted in this respect: land values are the highest in Peru outside Lima (figures shown in Figure 6 are based on the value of first class land in each district),[22] and tend to be highest of all near the river Chili and Arequipa. Yields are well above the average for Peru:

	Arequipa	*Peru*
Wheat	28 cwt/acre	8 cwt/acre
Maize	20 ,, ,,	9 ,, ,,
Barley	20 ,, ,,	8 ,, ,,
Potatoes	120 ,, ,,	39 ,, ,,

The intensive farming of Arequipa is, moreover, of long standing. The essentials of the modern system of farming were already present in the seventeenth century, when wheat, maize, potatoes, wine and fruit production were combined with the

Fig.6

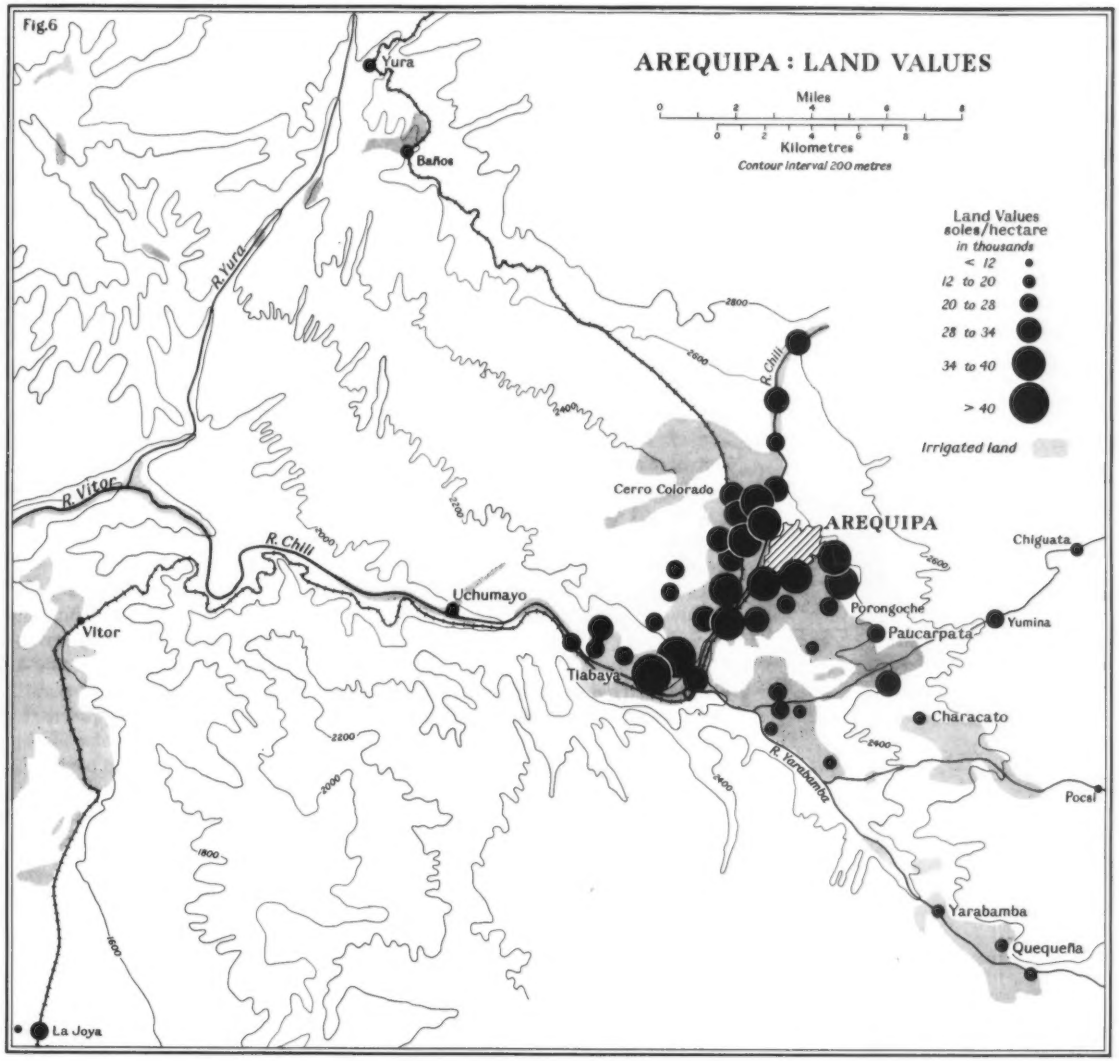

AREQUIPA : LAND VALUES
Miles
Kilometres
Contour interval 200 metres
Land Values soles/hectare in thousands
< 12
12 to 20
20 to 28
28 to 34
34 to 40
> 40
Irrigated land
Yura
Baños
R. Yura
R. Vitor
R. Chili
Uchumayo
Vitor
La Joya
Cerro Colorado
AREQUIPA
Tiabaya
Porongoche
Paucarpata
Chiguata
Yumina
Characato
Pocsi
R. Yarabamba
Yarabamba
Quequeña

Fig.5

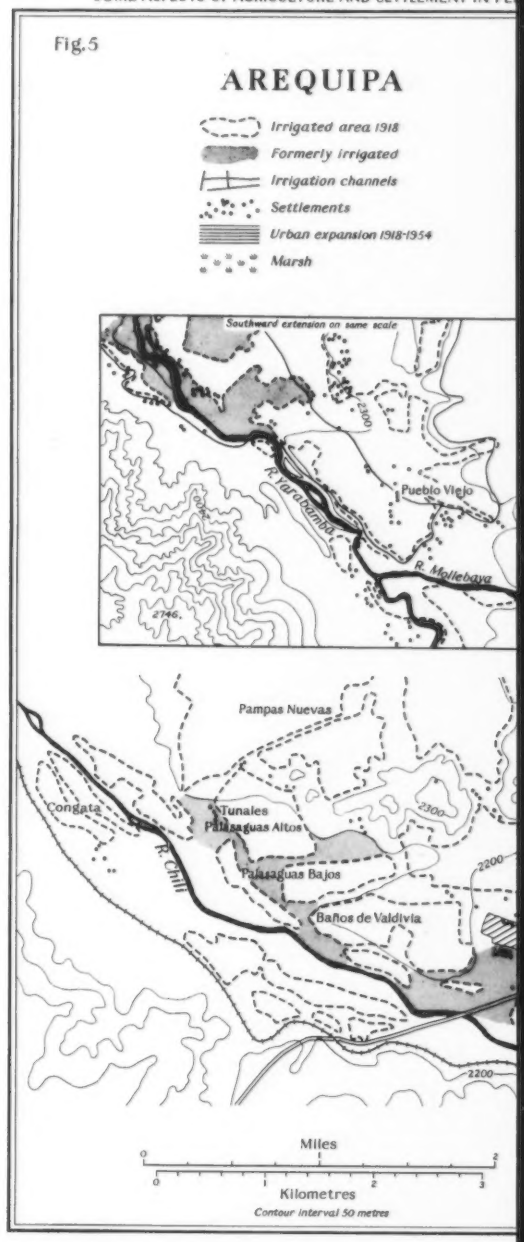
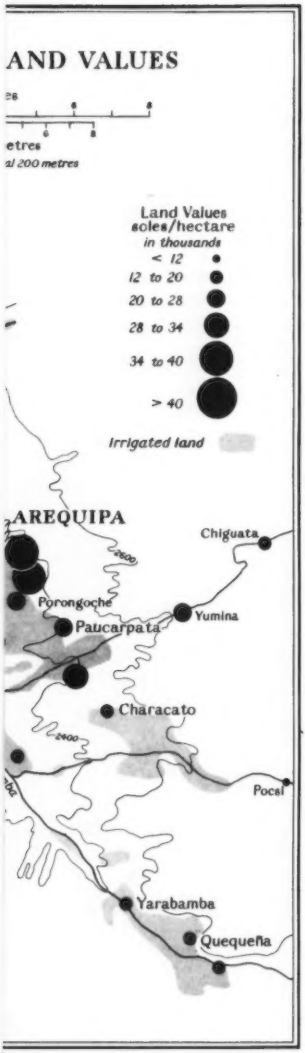
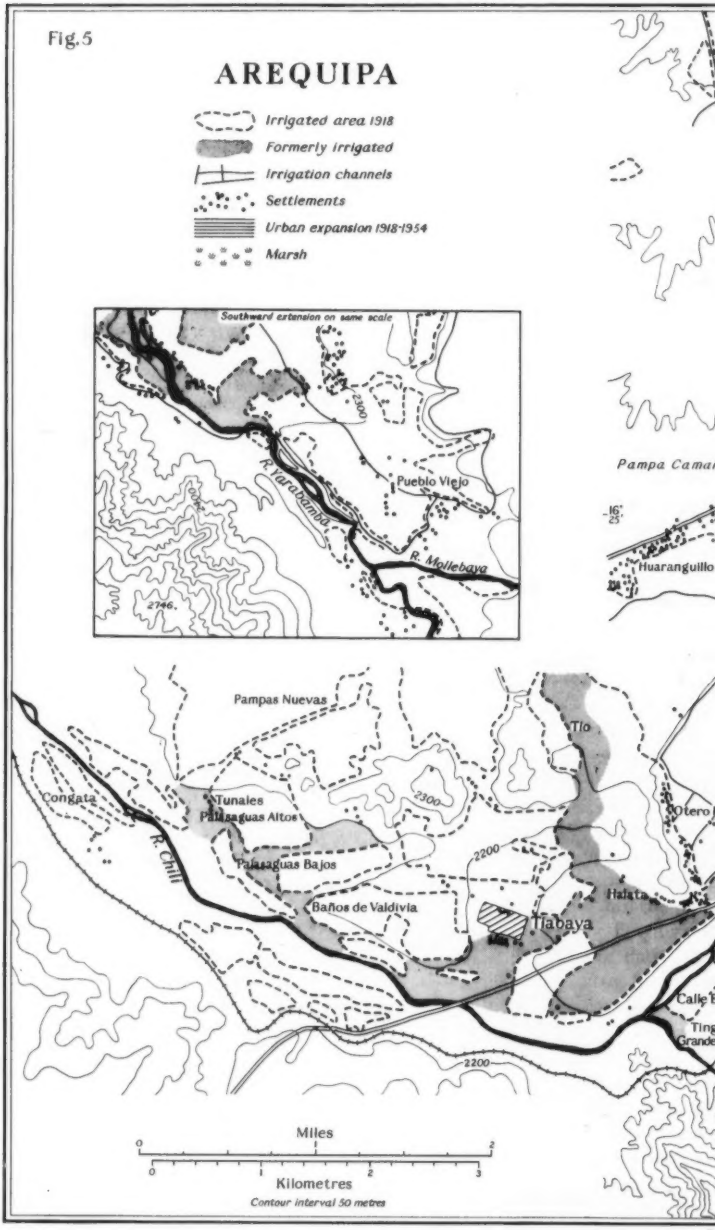
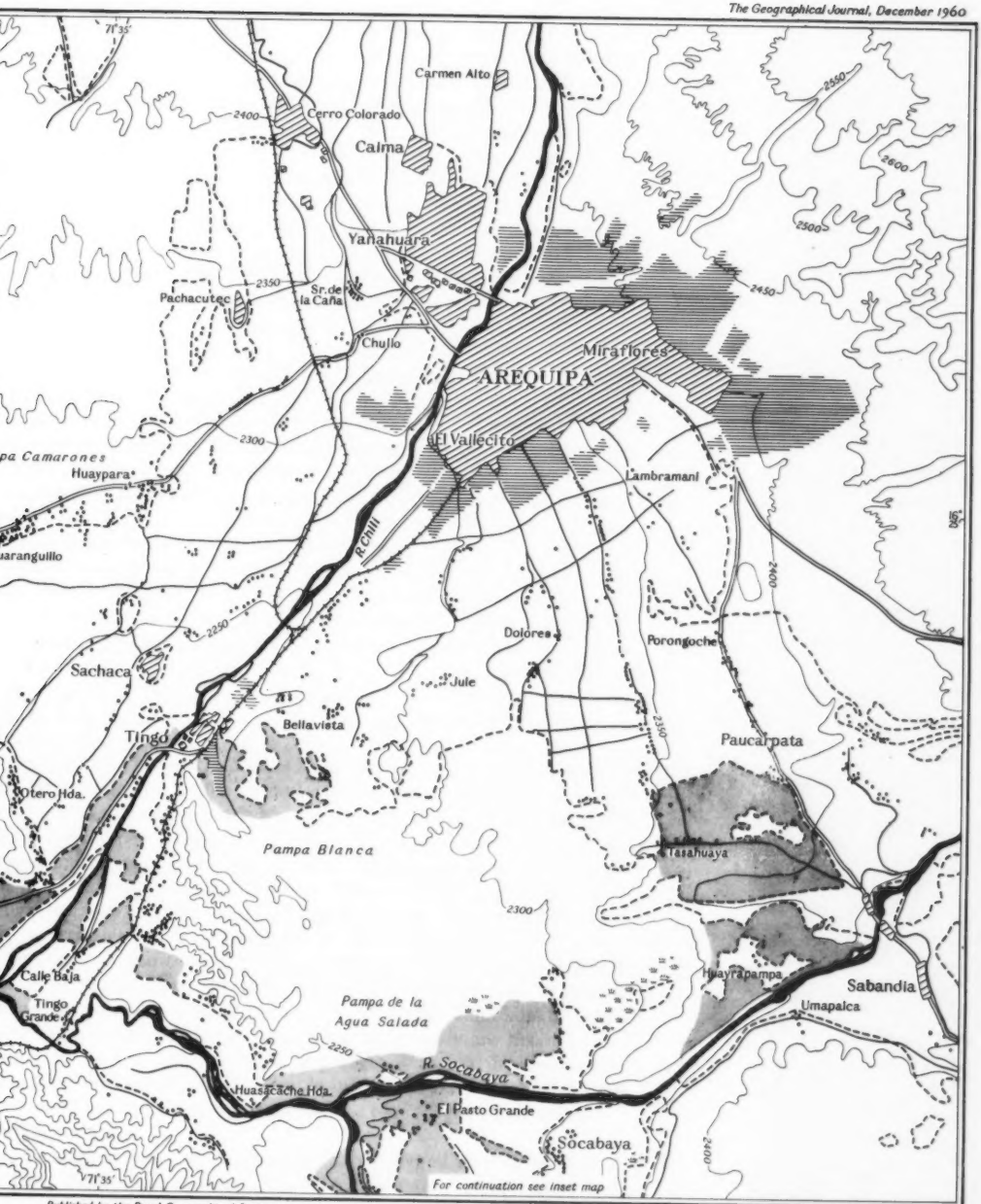

AREQUIPA
Irrigated area 1918
Formerly irrigated
Irrigation channels
Settlements
Urban expansion 1918-1954
Marsh
Southward extension on same scale
R. Yarabamba
Pueblo Viejo
R. Mollebaya
Pampas Nuevas
Congata
Tunales
Palisaguas Altos
Palisaguas Bajos
R. Chili
Baños de Valdivia
Miles
Kilometres
Contour interval 50 metres

Fig.5


AND VALUES
etres
al 200 metres
Land Values
soles/hectare
in thousands
< 12
12 to 20
20 to 28
28 to 34
34 to 40
> 40
Irrigated land
AREQUIPA
Chiguata
Porongoche
Yumina
Paucarpata
Characato
Pocsi
Yarabamba
Quequeña


AREQUIPA
Irrigated area 1918
Formerly irrigated
Irrigation channels
Settlements
Urban expansion 1918-1954
Marsh
Southward extension on same scale
R. Yarabamba
Pueblo Viejo
R. Mollebaya
2746.
Pampa Cama
Huaranguillo
Pampas Nuevas
Congata
R. Chili
Tunales
Palisaguas Altos
Palisaguas Bajos
Baños de Valdivia
Tiabaya
Tio
Otero
Hatata
Miles
Kilometres
Contour interval 50 metres


71°35'
Carmen Alto
Cerro Colorado
Calma
Yanahuara
Pachacutec
Sr. de la Caña
Chullo
AREQUIPA
Miraflores
El Vallecito
Lambramani
Huaypara
R. Chili
Dolores
Porongoche
Jule
Sachaca
Tingo
Bellavista
Otero Hda.
Paucarpata
Pampa Blanca
Tasahuaya
Calle Baja
Tingo Grande
Pampa de la Agua Salada
Huayrapampa
Sabandia
Umapalca
R. Socabaya
Huasacache Hda.
El Pasto Grande
Socabaya
2400
2350
2300
2250
2450
2500
2600
For continuation see inset map

production of alfalfa for the mule trade passing between the coast and the sierra. Although the railway replaced the mules from 1870 on the main route, this loss was more than compensated by a greater concentration of more prosperous absentee owners in Arequipa, by the revenues which flowed from a more intensive exploitation of wool and alpaca in the high sierra, and by the establishment of wool-washing and textile industries in the town. From an early date, local agriculture has been geared to the urban demands of Arequipa, regional capital of southern Peru, serving not only as a centre of communications and supply for the mines and stock-raising haciendas of the high sierra, but also as a residential centre. A congenial climate has encouraged settlement of the well-to-do, just as it has permitted the growth of temperate crops at a point accessible from the high sierra and within reach of the coast. Scarcity of irrigated land, high land values and the early emphasis on a stable mixed farming have encouraged concentration on intensive methods and high productivity.

The examples chosen tend to confirm the conclusions reached by Ford on the significance of land tenures and land holding in relation to economic development in the country as a whole. On the very large sugar estates the manipulation of available water, land use, field systems and even settlement patterns and urban planning are problems of industrial organization. Elsewhere one of the most striking features is the survival of patterns from a distant past. At Arequipa this is, perhaps, to be expected, but the Ica valley, linked by rail to Pisco since the 1860's and committed first by its wines and then by cotton to external trade, retains much evidence of pre-Conquest and colonial occupation, not only in its settlement forms and in its major irrigation canals, but also in its distribution of land holdings. In the Ica valley mere size of holdings is not necessarily a guide to the degree of mechanization, the efficiency of cultivation or land use. Large holdings are often worked by hand methods on small tenancies, small farmers on newly colonized land may have tractors, and most grow cotton. Too many holdings are too small to provide a satisfactory living, and wage labour or tenancies on larger estates are necessary to supplement income.

The area of cultivated land along the coast is being materially extended by methods which basically are represented by the examples of Ica, Paramonga and Arequipa. Large-scale schemes to divert the headwaters of streams to irrigable coastal land have improved or created new irrigation on 78,000 acres in the Quiroz district, and work is in progress to irrigate another 125,000 acres. 14,000 acres have recently been irrigated in the Santa Rosa project north of Lima. Plans exist to divert the waters of Atlantic-flowing streams to improve the water supply of Lima. Just as surplus water from the Pativilca irrigates the Fortaleza basin in an area where irrigable land is scarce, so, further north, ambitious plans exist to divert water from the river Santa along the foothills of the Andes to northern valleys, and work has already begun, backed by Venezuelan capital, to irrigate some 55,000 acres near Chimbote by water from the Santa. Where water-tables are accessible, tube-wells are making substantial contributions to the irrigable land as well as reducing dependence on excessively seasonal river regimes, as for example in the Pampa de la Yarada near Tacna. Schemes such as these promise to increase the total irrigated land along the coast by as much as a third.

In Arequipa, a balanced and mixed agriculture has emerged to serve accessible markets on the basis of a peasant economy. A more regular water supply is promised, and much could be done yet in improving stock and stock diet, lining of irrigation channels and improvement of seed; but mechanization would seem to have little

relevance here. The success attained in the production of concentrated milk products and the stimulus it has given to intensive farming may have wider implications outside Arequipa itself. In Peru as a whole, wealth, population and industry are perhaps excessively concentrated in the rapidly expanding capital city. Apart from the obvious advantages of the capital for industrial location and the employment offered by expanding government functions, the improvement of communications on the coast and to the sierra have made it possible for absentee owners to change their residence from provincial capitals to Lima, with its substantially higher standards of public service, health, education and recreation. Demands for foodstuffs, services and artisans, which were once locally satisfied in the neighbourhood of regional capitals, are transferred to Lima, where the imported article is often cheaper, more easily available, often of better quality or with greater prestige than the domestic product. The dependence of Peru on imported wheat, for example, shows no sign of decreasing. The stimulus given to provincial farming in the Andes by the establishment of dairy plant is therefore of some importance. The experience of Arequipa may have some relevance for Cajamarca farther north. The Cajamarca basin is slightly higher (8650 feet), with a correspondingly greater risk of frost than Arequipa, and has a reliable rainfall of 31 inches; but farming would benefit from more extensive irrigation. Wheat, barley and maize are the chief crops from medium or small farms, which produce very low (estimated) yields of 8 cwt/acre of wheat and maize. Since the establishment of a milk processing factory at Chiclayo on the coast in 1946, milk production has become profitable, and its increase has justified the recent construction in Cajamarca itself of a pre-condensing plant which collects milk from over 200 farms in the area. Improved stock is being imported; alfalfa and clovers are a little more widely cultivated to the benefit of soil fertility and to the yields of wheat, barley and maize which are rotated with them; and interest in irrigation has been aroused. Agricultural change is here just beginning.

REFERENCES

[1] Schweiggar, E., 'El litoral Peruano,' Lima, 1947, p. 12 *et seq.*

[2] Calculated from annual issues of the *Boletín de Estadistica Peruana*. See also G. de Reparaz, 'La zone aride du Pérou,' *Geogr. Ann. Stockh.* **40** (1958), pp. 11–62.

[3] Further investment of $1,300,000 for the extension of the chemical industry at Paramonga to produce caustic soda and chlorine was announced in July 1959. *Peruvian Times* 31 July 1959.

[4] Higginson, Eduardo, 'Map of the Republic of Peru, with a short description of the country,' Southampton, 1903.

[5] Romero, Emilio, 'Historia económica del Peru,' Editorial Sud-americana, Buenos Aires, 1949, p. 413.

[6] Ford, T. R., 'Man and land in Peru,' Gainesville, 1955, p. 58.

[7] Burgess, E. W., and F. H. Harbison, 'Casa Grace in Peru: United States business performance abroad,' National Planning Association, 1954, p. 77.

[8] Lopez de Velasco, Juan, "Geografía y Descripción de las Indias, 1571–4," *Bol. Soc. geogr. Madr.* (1894).

[9] Middendorf, E. W., 'Peru,' Berlin, 1894, p. 155.

[10] Vasquez de Espinosa, "Compendium and description of the West Indies," translated and edited C. U. Clark, *Smiths. misc. Coll.* **102** (1942), p. 485.

[11] Bueno, Cosme, 'Geografía del Perú Virreinal, ca. 1764–9,' ed. D. Valcarcel, Lima, 1951, p. 30.

[12] de la Vega, Garcilaso, 'Royal Commentaries of the Yncas,' Vol. 2, ed. C. R. Markham, Hakluyt Soc., Vol. 45, 1871, p. 13.

[13] de Acosta, J., 'History of the Indies,' ed. C. R. Markham, Hakluyt Soc., Vol. 60, 1880, p. 267: Vasquez de Espinosa, *op. cit.*, p. 483–4.

[14] Willey, G. R., 'Prehistoric settlement patterns in the Virú Valley,' *Bull. Bur. Amer. Ethnol.* **155** (1953).

[15] *Peruvian Times* 27 November 1959.
[16] de Reparaz, G., *op. cit.*
[17] Romero, Emilio, 'Geografía económica del Peru,' Lima, 1953, p. 339.
[18] Ford, T. R., *op. cit.*, p. 63.
[19] Ed. Israel Gonsalez Herrera, 'Guía general de Ica,' 1944.
[20] Ford, T. R., *op. cit.*, p. 62.
[21] Jenks, W. F., 'Notas acerca de la Geología de la región de Arequipa,' Arequipa, 1945, p. 23.
[22] "Memoria de Economía Agropecuaria, Arequipa," 1947 (typescript).

DISCUSSION

Afternoon Meeting, 23 March 1959

The CHAIRMAN (Professor L. Dudley Stamp): Your Excellency, Ladies and Gentlemen: rather over two years ago the International Geographical Congress, at which the Royal Geographical Society was represented, met for the first time in Latin America and for the first time in the Southern Hemisphere. We may perhaps claim that from that time particularly there has been a marked resuscitation of interest in the geographical affairs of South America. Tonight we are to have an account by Mr. C. T. Smith, who is lecturer in geography at the University of Cambridge, dealing with some of the problems of land use and settlement in Peru. Mr. Smith carried out a study tour in 1957 and he is going to give us some of his results.

Mr. Smith then read his paper

The CHAIRMAN: Before opening the meeting for general discussion, I wonder if I could persuade His Excellency the Peruvian Ambassador to say one or two words.

H.E. THE PERUVIAN AMBASSADOR: Mr. Chairman, Ladies and Gentlemen: I have listened with great interest to this lecture and I wish to congratulate Mr. Smith most heartily on the deep study he has made of the agricultural conditions in my country.

The CHAIRMAN: I hope you will allow me to say how very much I personally have enjoyed this lecture. It happens to be exactly twenty-five years ago this month that I was going over much the same ground myself and it is amazing to see the progress made. When I see some of the pictures of modern factories, and of macadam asphalted roads, my mind goes back to the old days of dust, dust, dust! To see Holstein cattle there, looking as healthy as anywhere in the world—I can assure you this is something which has happened very much in the last twenty-five years.

Now, I know there are some who are interested in many of the points raised. Would Professor Buchanan care to come forward and say a few words?

Professor R. O. BUCHANAN (London School of Economics): Unlike Professor Stamp and Mr. Smith, I have not been in the area at all. I have, however, been interested in some aspects of the agricultural geography of the coast-lands of Peru and I was recalling, during his concluding remarks, that something like forty-five years ago it was reckoned that everything that could be irrigated in the coastal river valleys had already been irrigated. Either there was no more land available of the sort that you could bring irrigation water on to, or else, if there was land, there was no more water. As Mr. Smith has explained, the application of the tube-well device and the diversion of eastward-flowing headwaters from the High Andes down to the west have already made a very great difference and are going to make more difference.

I was struck particularly by the description of the sugar estate, which has points of interest for anyone interested in the organization of agriculture at large. These are the days when we are being told by various authorities and pseudo-authorities that the day of the plantation is past, and indeed it is true that in some parts of the world, in Indonesia for example, the plantation system seems already to be on the way out. It is very striking to find a plantation system which, out of its own efficiency, is not merely holding its own but is progressing, becoming bigger and more efficient.

Not less interesting, however, is the co-existence of the plantation and the small holding in the cotton areas. This is not entirely a matter, it would seem, of the ability

of the small man to compete directly with the plantation, but rather, as happens in Cuba and possibly elsewhere as well, to some extent of cooperation between the estate and the small man, the small man providing some of the estate labour, his small holding being, so to speak, a sideline, while the estate mill provides a market for his cane.

Another thing that struck me is the way Mr. Smith has gone back into the past to find the roots of the present. Now I am quite certain that there is no problem in current economic geography in this whole wide world that can be thoroughly understood unless you understand how it became like that. And that means an evolutionary study, an historical study, and we have had this afternoon, as I see it, a well-nigh perfect example of that. I would end with just one minor point: I was interested to hear the black and white cattle called Holsteins. They were of course Holsteins, but on this side of the world, where equally they are growing very rapidly in significance, the alternative name, Friesian, seems to have banished Holstein completely. It has not, however, done so in the United States.

The CHAIRMAN: May I call on Mr. Farmer from the University of Cambridge?

Mr. B. H. FARMER: I want, if I may, to raise one question about the Paramonga sugar estate. Mr. Smith spoke of the trend in Peru in general, and in Paramonga in particular, towards the closer integration of the plantation on the one hand and of the factory on the other. He said that this was due partly to the strictly controlled rotation of harvests, which enables a constant supply of cane to come in to the factory, and also he attributed it to Grace Brothers's foreign investment. Now it happened that the very day that I read the transcript of his paper I was also reading Tempany and Grist's new book called 'An introduction to tropical agriculture,' in which the authors give (on pp. 237–8) examples from Mauritius and from Fiji to show that a number of sugar companies which formerly ran their own plantations and their own factories have given up the plantations. This is partly for fortuitous short-term reasons, such as low prices and times of difficulty, but it is partly also a result of increasing technological complications in sugar manufacture. Because of this, companies have found that the two sides of the activity, cane-growing on the one hand and the factory on the other, were diverging so much and so rapidly they simply could not hold the two together and so decided to sell out on the plantation side. It would be interesting to know why it is that in Peru this tendency does not seem to have taken place and why in fact the reverse seems to be the case.

And then secondly, Mr. Chairman, I would like to turn for a moment to the peasant area at Arequipa. Mr. Smith's comments on the peasants there interested me very much indeed, for this reason. In many places that he talked about, the economy has all the features that we tend to associate with a peasant economy: over-population, low productivity, small units of cultivation, and so on. Most of us, I suppose, would follow the usual party line of the agricultural economist and say that all the unfortunate sides of peasant cultivation are causally connected to small units of cultivation and to the fact that the economy is based on the peasant. Now here is Arequipa giving the lie, it seems to me, to this sort of generalization: here are peasants with very small plots, yet they are highly productive and very prosperous; they react to markets, they bring in new breeds of cattle, and they do the things that one might associate with progressive large-scale cultivation. I mention this because it seems to me that we are in danger of thinking that efficient cultivation has to be on a large scale, possibly that it has to be mechanized. We forget, I think, that where labour is plentiful and land and capital scarce, the only wise thing to do is to maximize production in terms of the scarce factors—in other words, to get the maximum possible yield *per acre* and *per unit of capital investment*, and not to worry if labour is apparently wasted. The implication is that in those circumstances one can afford to be very intensive and to work on small plots. I personally am quite convinced that where there are in fact *diseconomies* of scale where rice cultivation is concerned, it is better in terms of yield per acre to work on small plots. And perhaps Arequipa, with its rather special physical, economic and historical conditions, is a good example of the same sort of thing in a different context.

The CHAIRMAN: Is Dr. Crossley here? Dr. Crossley, of University College London, is one of those who has recently carried out special studies in South America.

Dr. J. C. CROSSLEY: I was especially interested in what Mr. Smith had to say about changes in the extent of irrigated land, and also in Professor Buchanan's remarks on the importance of the historical approach in the study of agricultural geography. Some eight months ago I had the good fortune to meet in Cuzco Dr. Richard Schaedel, an American archaeologist who, along with others, has been working on this problem from an archaeological point of view. I understand that extensive studies throughout the length of the Peruvian coastal plain suggest that the prehistoric area of irrigated land to the north of Paramonga exceeded the present area. Conversely, to the south of Ica, another locality with which Mr. Smith has dealt this evening, the prehistoric irrigated area was less than the present. Finally, between Paramonga and Ica the prehistoric and modern irrigated areas are roughly equal in size though not conterminous in location. Whether this suggestion is to be explained purely in terms of human factors such as Mr. Smith has touched upon, or whether some differential climatic change must also be invoked, I do not know.

The CHAIRMAN: Mr. Peter Haggett of the University of Cambridge?

Mr. P. HAGGETT: Mr. Smith, who is already well known for his work in showing the importance of historical evidence in geomorphological research, has shown us likewise the importance of historical evidence in understanding current agricultural problems in Peru. I was particularly interested in his comments on the "pit" agriculture practised in the arid coastal areas of southern Peru. This is a type of dry farming which has attracted the attention of other Latin American agriculturalists particularly those from the dry zone of Ceará in north-east Brazil. One of the problems Mr. Smith has indicated is that these *hoyas* or *canchones* may well have been far more widespread in pre-Columban times than today. Certainly Garcilaso de la Vega's 'Comentario reales de los Incas,' written at the end of the sixteenth century, describes crops grown in great pits 5–6 acres in extent and dug up to 18 feet below ground level. One of the more serious aspects in the abandonment of this method in the ensuing centuries seems to be the permanent loss from the indigenous agriculture of a number of food crops. Yacovleff and Herrera list (*Rev. del Mus. Nac. de Lima*, 3, pp. 241–322) nearly twenty species formerly grown in the pit areas in Inca times. More serious than the loss of unimportant food plants may well be the permanent loss of edaphically adapted varieties of important crops like maize. It may well be that, rather than spreading heavy-yielding North American stock uniformly through Latin America, more attention might be given to breeding from the indigenous varieties grown by the Indian agriculturalists. If, as seems indicated by the historical evidence, these arid coastlands were never more highly farmed than under the Incas, then it may well be that part of the answer to present land use problems there lies in the kind of research Mr. Smith has indicated this afternoon.

Mr. W. V. LEWIS (University of Cambridge): Mr. Smith made the significant point that snow-melt supplies water to the rivers more uniformly throughout the year in Peru than in higher latitudes. Snow-melt usually gives a sudden surge to river discharge during the early spring, as in the plains of Siberia and, of course, in the Alps. Pardé refers to the "snow regime" as one with a tremendous peak discharge during the period of snow-melting and very little discharge for the rest of the year. The effects of snow-melt in equatorial latitudes may be very different, and this illustration may help to reduce our bias towards considering the effects of glaciers and of snow-melt on river regimes only in middle latitudes.

Mr. C. T. SMITH: In response to Professor Buchanan's remarks, may I defend the use of the local terminology, which is to call the breed in question Holstein, following North American practice.

Secondly I should like to take up the points which Mr. Farmer raised. Sugar production in Peru almost certainly has to be seen against the background of the inter-war period when firms like Grace Brothers were acquiring properties, sometimes as a result of carefully planned investment, and at other times as a means of recovering debts.

Paramonga reached its present state in two stages. The first stage was the amalgamation of four haciendas and the second was the acquisition of the whole by Grace in 1927. The problems of specialization appear to have been satisfactorily solved by very large scale organizations such as Grace in Peru, at least, and their interests often ramify widely byond sugar, of course. I welcome Mr. Farmer's comments on the relationship between peasant farming and efficient land use. The farming of Arequipa, particularly, seems a very successful way of using an environment which is not too easy, but has the possibility of great production with careful irrigation and cultivation. Tiny plots are inevitable on land which has been so systematically terraced, whatever the scale of land-holding units, and their careful cultivation makes for maximum yields in a zone where markets are near and agricultural land is limited.

Mr. Crossley has underlined a theme which I think is important and profitable in the study of the coastal valleys: the integration of archaeological and geographical survey. It is a combination, indeed, which has proved very profitable in the intensive study of the Virú valley, but I would also plead for more intensive local studies of the development of agricultural practice and land holding in the colonial period, and particularly in the nineteenth century.

Mr. Haggett's remarks may illustrate in yet another way the importance of studies of the past for understanding present conditions in Peru, and even for pointing the way to greater agricultural knowledge which may be of use in the reclamation of the arid coastlands. Yet it may be a little premature to regard the Inca period as that in which the maximum extent of cultivation on the coast was reached, for there is a suggestion that it had been reached at an earlier phase in Peruvian prehistory, and that the development of *hoya* cultivation, at least in the Virú valley, may have coincided with a decline elsewhere in the irrigated arable.

If I may comment very briefly indeed on Mr. Lewis's remarks, the importance of diurnal freeze and thaw was brought home to me forcibly by camping one evening on what seemed a dry and well sheltered site below a vertical cliff, until the following morning brought a steady and most uncomfortable trickle of meltwater.

GEORGE PERKINS MARSH ON THE NATURE AND PURPOSE OF GEOGRAPHY

DAVID LOWENTHAL

AMERICAN GEOGRAPHERS before the twentieth century devoted little attention to the history and methodology of the field.[1] Their occasional prefatory pronouncements in substantive works have small value either as definitions of geography or as analyses of its place and function in scholarship. About all that the "Father of American geography," Jedidiah Morse, has to say on the subject is that "Geography was very imperfect in its beginning, and has advanced slowly toward its present degree of perfection."[2] Such a belief might in itself be a formidable deterrent to critical analysis.

The dearth of methodological records lends the more significance to an unpublished paper written in 1869 by George Perkins Marsh. Although Marsh never considered himself a professional geographer, his book 'Man and Nature' was the most important American geographical work of the nineteenth century. The following statement, which was designed as an introduction for Élisée Reclus's 'La Terre,' is the only one in which Marsh specifically concerned himself with the nature and purpose of geography.[3]

"*Physical Geography*[4] may be defined as the science of the absolute and relative conditions of the earth's surface and of the ambient atmosphere, as they manifest themselves to ordinary sensuous perception. Of all the branches of natural knowledge, no other has so many visible points of contact with the material interests of human life, no other deals with subjects whose practical importance is so constantly forced upon our notice, no other so essentially consists in the investigation of the relations of action and reaction between man and the medium he inhabits. Hence Physical Geography ought, logically, to be the oldest of the sciences; but, from man's propensity to overlook the palpable and the near, and to grasp at the obscure and remote, this study, as a distinct body of principles and of facts, has been longer neglected than almost any of the sister disciplines. It is little more than a hundred years since *Buache*[5] led the way in separating Physical from Mathematical and Political Geography, and it was only when *Ritter* organized the science on the basis of comparison and analogy that any general view of the more comprehensive relations between man and nature became possible, and that the claims of Physical Geography to recognition, as a substantive field of philosophical inquiry, were allowed.

The claims of Physical Geography to be regarded as a science do not depend upon accuracy of measurement, whether of force, of time, of distance, or of mass. It neglects minute quantities, takes no account of molecular action, and everywhere contents itself with approximate values. Hence, while it does not supply the intellectual training derived from the pursuit of the exact sciences, its successful cultivation does not demand a familiarity with analytical reasoning or with the abstruse problems of pure mathematics, and it does not repel the student by a forbidding nomenclature, barbarous in etymology or hybrid in formation. It appeals to the widest circle of thinking men, its special phenomena are facts of hourly and universal observation, and it is consequently better fitted for what is called *popularization*, than almost any other of the numerous branches of natural knowledge with which the last two centuries have enriched the world. Indeed, Physical Geography can hardly be said to exist, strictly speaking, in any other than a popular form; for

logically and philosophically sound as are its conclusions, they are not reached by abstruse processes, and its methods of investigation are not, in the ordinary sense of the term, scientific. At the same time, its intimate connection with the well-being and social progress of all the tribes of man invests it with a lofty interest even as a field of simply speculative inquiry, and entitles it to a high place among what, in the French classification of human knowledge, are designated as the *Moral Sciences.*[6]

Physical Geography is not divided, by any sharply drawn line, from geology and mineralogy, from chemistry and meteorology, from botany and zoology; for its field, the Earth, is the common theatre of all the phenomena with which these sciences are conversant, the scene of the sensuous manifestation of all the natural forces which ancient philosophy regarded as diverse, or even as reciprocally hostile, but which modern science soon found to be analogous, and is now almost prepared to proclaim, identical. The energies which determine the configuration and clothing of the earth's surface, and the changes of its external aspect, are resultants of the complex action both of organized life and of inorganic nature. Physical Geography, therefore, forms a common bond between the various branches of material research, receives contributions from all, and in turn supplies to all, illustrations of the action of newly discovered forces, or newly observed modifications of already known forces, and consequently helps to elucidate these great problems which seem on the one hand to be rapidly advancing toward a definite solution, and on the other to be growing hourly more hopelessly perplexed, by the introduction of new elements and the discovery of new conditions.

The volumes now brought to the notice of the English and the American public are the work of a writer . . . whose views have been enlarged and rounded out, like those of *Humboldt*, by actual observation under all conditions of climate and over a wide range of terrestrial surface. . . . Hence his descriptions of the face of nature and of the visible action of physical forces . . . have the vividness of colouring which characterizes the testimony of an eye-witness, and they compose a perpetual commentary on the geographical principles laid down by more exclusively speculative writers. *Guyot*, on the other hand, in his remarkable volume, *The Earth and Man*,[7] deals mainly with the broadest facts, the largest inductions, and enters comparatively little into anything approaching picturesque detail. Hence his work and that of our author happily illustrate and confirm each other. . . .

But, though . . . the descriptive element is more conspicuous than the theoretical . . . the philosophical side of the argument has not been by any means suppressed or neglected, and *The Earth* of Mr. Reclus will be found to contain not only a most comprehensive view of the great facts which belong to the domain of Physical Geography, but full expositions of the rationale of these facts. . . . To these merits is to be added a lucidity of method and of exposition which is unhappily much more rare in English and in German than in French scientific treatises. . . ."

Parts of this statement derive from familiar models. The paragraph in which Marsh describes geography as a link between the systematic sciences, a method of synthesizing diverse materials, rather than a discipline with a unique subject matter, simply recapitulates the classification established by Kant, Humboldt, and Ritter.[8] The logic of this argument was reinforced by faith in the unity of nature, a unity geography was thought well suited to reveal.

The notion that geography was particularly concerned with relations between man and nature was likewise traditional.[9] However, Ritter and Guyot always emphasized nature's impact on man; for Marsh the relationship was one of "action and reaction." In 'Man and Nature' Marsh had demonstrated that "every plant, every animal, is a geographical agency." While other geographers had studied "how

far external physical conditions . . . have influenced the social life and social progress of man," Marsh observed that "man has reacted upon organized and inorganic nature, and thereby modified, if not determined, the material structure of his earthly home." That the second subject presupposed the first, Marsh admits. "Only when it was known how the mode of our physical, moral, and intellectual being is affected by the character of the home which Providence has appointed," was it useful "to inquire whether we have or can become the architects of our own abiding place."[10] But philosophical bent as well as geographical observation impelled Marsh to emphasize man's freedom of will and power over nature, in opposition to the teleological determinatism of Ritter and Guyot.[11]

The usefulness of geography, as outlined by Marsh, was a concept better known in America than in Europe. According to Ritter and Guyot, the noblest aim of geography was to "pursue the investigation of these wondrous harmonies of nature and history."[12] But American geographers hoped to contribute more immediate benefits. "Few studies are more useful," wrote Jared Sparks, in a plea for the study of geography in 1813; "there is no science whatever which comes so often into use in common life."[13] Like Sparks, Marsh brought geography down to earth, showed its applicability to contemporary problems, and underlined its practical significance. His concern for "the well-being and social progress of all the tribes of man" was an active and pragmatic philanthropy, in contrast with the evangelical piety or the lofty but theoretical benevolence of European scholars.

Associated with the aim of utility was the concept of geography as easy to understand, not abstruse, an excellent subject for the layman. The modern professional may find abhorrent, perhaps even embarrassing, the suggestion that his subject might be mastered by amateurs; only the esoteric is deemed scientific. But to Marsh and others of his time simplicity and intelligibility were virtues. Before they learned that it paid to be recondite, scholars thought popularization praiseworthy. 'Geography made easy' was the first book Jedidiah Morse wrote.[14] Jared Sparks was trying to advance geography, not to damn it, when he claimed that no subject "can be of more easy attainment to every capacity. It requires no vigorous exertion of thought, no extraordinary effort of intellect to become in a degree master of it."[15]

Marsh did not consider geography all that easy. It required keen powers of observation, great skill in synthesis. If geography did not supply "the intellectual training" of the exact sciences, it "affords to the eye the best general training that is accessible to all."[16] (In theory, though not always in practice, Marsh restricted the subject matter of geography to what was "manifest . . . to ordinary sensuous perception.") But geography was not physics. The "exact" sciences dealt with the "obscure and remote," geography with the "palpable and the near." Indeed, Marsh considered geography as much an art as a science. In an earlier essay, his discussion of nature focused on geography as poetry and philosophy, the concern of landscape painters and writers.[17]

Believing that geography ought to remain a truly "moral" science, far-ranging and with wide appeal, Marsh worried lest specialization impede popularization. The "forbidding nomenclature" and "barbarous terminology" of chemistry and botany were as obnoxious to Marsh as present-day humanists find the pompous jargon of social science.

Of all the "hopeless perplexities" of nineteenth century science, statistics seemed to Marsh perhaps the worst threat to scholarship. Too often figures were rigged to prove a point, or a specious show of accuracy masked ignorance. Marsh mistrusted the affectation of rigour and method, especially where—as in climatology—instruments were inadequate and controls were lacking. He doubted whether many of the

problems most important to man were susceptible to measurement, at least within the reasonably near future. Besides, social and political decisions could not be delayed for statistical validation, as Marsh pointed out in 'Man and Nature': "the world cannot afford to wait till the slow and sure progress of exact science has taught it a better economy."[18] Marsh's last geographical word on the subject, in the final edition of 'Man and Nature,' shows that the passage of time had not diminished his aversion to statistics: "The introduction of mathematical method into the study of physical science, though attended with some highly beneficial effects, has impeded the progress of Physical Geography by discouraging its pursuit as unworthy of cultivation because incapable of precise results."[19]

In recent years, geographers have increasingly sought scientific respectability by striving to quantify their work. A more powerful mathematics than Marsh dreamed of is now helping to open up new avenues of geographical research. This trend will, no doubt, result in major advances.[20] As in Marsh's day, however, excessive enthusiasm for quantification tends to sanctify error and to multiply trivia,[21] while clarity and universality vanish. It is well to remember that not everything worth studying in geography can be "fully and correctly described in quantitative terms."[22] Many geographers are still concerned "with processes that are largely non-recurrent and involve time spans mainly beyond the short runs available to enumeration."[23] Thought is not possible without abstraction, but abstraction always involves exclusion from the subject matter and shape of reality. The "fallacy of misplaced concreteness"[24] is as apt to bedevil contemporary geography as it did classical physics.

REFERENCES

[1] Hartshorne, Richard, 'The nature of geography,' pp. 22–3, Lancaster, Pa., 1946; David Lowenthal, "George Perkins Marsh and the American geographical tradition," *Geogr. Rev.*, 43 (1953), p. 207.

[2] Morse, Jedidiah, 'The American universal geography,' 7th ed., Vol. 1, p. 10 (Charleston, Mass., 1819).

[3] The manuscript is part of the Marsh Collection in the Wilbur Library, University of Vermont. Only the first three paragraphs concern geography in general; the last two paragraphs, relating specifically to Reclus's work, are here abridged.

On the reverse of the manuscript appears the following: "This notice of Reclus's La Terre was prepared at his request as an Introduction to the English Translation of that work. Whether it was actually used, I do not know, but I have seen quoted, from the introduction to the English edition of Reclus, passages which I certainly never wrote and which of course are not found in this paper. G. P. Marsh." Jean-Jacques Élisée Reclus (1830–1905), whose 19-volume 'Nouvelle géographie universelle' (Paris, 1875–94) made him Ritter's best-known French disciple, was also greatly influenced by Marsh (see J. R. Whitaker, "World view of destruction and conservation of natural resources," *Ann. Ass. Amer. Geogr.* 30 (1940) pp. 147–149; David Lowenthal, 'George Perkins Marsh, versatile Vermonter,' pp. 269, 375–6 [New York, Columbia University Press, 1959]. Apparently Marsh initiated the correspondence after reading the first volume of Reclus's 'La Terre' (Paris, 1867) for, on 14 April 1868, Reclus wrote Marsh: "Je vous remercie avec effusion des corrections que vous avez bien voulu faire à mon livre . . . J'espère que mon deuxième volume sera moins fautif que le premier; j'y mettrai tous mes soins, et grâce à vous, la dernière partie, consacrée au travail de l'homme, sera certainement exemptée des énormités géographiques." (All letters are from the Marsh Collection, University of Vermont.) In the preface to the second volume (Paris, 1868), Reclus thanks Marsh for having pointed out several errors in the text of the last two chapters. Meanwhile, Marsh was trying to persuade Charles Scribner, his own publisher, to bring out an English translation of 'La Terre,' for which Reclus asked Marsh to prepare "une petite préface . . . auprès le public anglais et américain, quand même l'éditeur se trouve changé" (14 October 1868). In 1869 the English translation was under way in London, where Reclus accepted Marsh's repeated offer to prepare a preface, "qui sera certainement une addition des plus importantes à mon livre" (20 August 1869). Marsh must have written it in

September 1869; on October 3 Reclus wrote him from Paris: "Je ne saurais trop pour vous remercier de la préface que vous m'avez envoyée; elle est pleine d'idées ingénieuses dont je ferai mon profit, et je me garderai bien d'y toucher pour y changer quoique ce soit, ainsi que vous me donnez l'autorisation. Le seul changement que je pourrai vous demander de vouloir y faire consistérait dans la suppression d'un simple membre du phrase, "*like those of Humboldt*." En me comparant à cet homme puissant, vous me rendez bien petit par le contraste." But 'La Terre' appeared in English ("The Earth; a Physical History of the Phenomena of the Life of the Globe,' trans. B. B. Woodward, 2 v. [New York, Putnam, 1871]) without Marsh's introduction.

[4] Marsh meant by "physical geography" what we would call "systematic geography," including man as well as the rest of nature. For the use of "physical" during the eighteenth and much of the nineteenth century, see Richard Hartshorne, 'Perspective on the nature of geography,' *Monagr. Ser. Ass. Amer. Geogr.* No. 1, pp. 67–8 (Chicago, Rand McNally, 1959).

[5] Philippe Buache (1700–73), author of 'Considérations géographiques et physiques sur les nouvelles découvertes de la grande mer' (Paris, 1753) and of later works dividing the earth according to mountain chains and other physical features.

[6] *I.e.*, philosophy and economic and political science.

[7] Published by Scribner, New York, 1849. For Marsh's relations with Guyot, see Lowenthal, 'Marsh,' pp. 184, 196, 269.

[8] Hartshorne, 'Nature of geography,' pp. 134–6, 370–2.

[9] Hartshorne, 'Perspective on the nature of geography,' pp. 48–9.

[10] 'Man and Nature; or, Physical geography as modified by human action,' pp. 8–9, 57 (New York, Scribner, 1864). This statement seems to assume knowledge of the nature of environmental influence. Elsewhere, however, Marsh points out that the "effects of human action on the forms of the earth's surface [can]not always be distinguished from those resulting from geological causes" (*ibid.*, p. 50).

[11] Lowenthal, 'Marsh,' pp. 271–4. For a concise statement of Guyot's views on geography, see Arnold Guyot, "Geography," in 'Johnson's New Universal Cyclopaedia' (ed. F. A. P. Barnard and Arnold Guyot), Vol. 2, pp. 478–80 (New York, 1876). It is interesting that Guyot was in charge of the departments of "Physical geography, Foreign geography, Climatology, etc.," while Marsh headed the department of "English and foreign literature, etc." (p. iv).

[12] Guyot, Arnold Henry, "Carl Ritter: an Address to the Society," *J. Amer. Geogr. Soc.* **2**, 1 (1860), p. 63.

[13] MS. in Sparks Collection (132, Misc. Papers, Vol. 1, 1808–14), Harvard College Library, quoted in Ralph H. Brown, "A plea for geography, 1813 style," *Ann. Ass. Amer. Geogr.* **41** (1951), pp. 232, 235.

[14] Brown, Ralph H., "The American geographies of Jedidiah Morse," *Ann. Ass. Amer. Geogr.* **31** (1941), pp. 145–217, ref. on p. 214.

[15] Quoted in Brown, "A plea for geography," p. 235.

[16] 'Man and Nature,' p. 12.

[17] "The study of Nature," *Christian Examiner* **68** (1860), pp. 33–62.

[18] 'Man and Nature,' p. 55. Marsh's strictures against statistics must be viewed in the context of its then intimate association with geography—not until 1871 were the words "and Statistical" dropped from the name of the American Geographical and Statistical Society—and as a reaction against the "exalted view of the function of statistics" held by certain enthusiasts in government and business (John K. Wright, 'Geography in the making; the American Geographical Society 1851–1951,' pp. 46–7, 82–3 [New York, American Geographical Society, 1952]).

[19] 'The Earth as modified by human action,' pp. 13n–14n (New York, 1885).

[20] Ackerman, Edward A., "Geography as a fundamental research discipline," p. 12, University of Chicago, Department of Geography, Research Paper No. 53 (Chicago, 1958).

[21] Spate, O. H. K., "Geography in a quantifying age," *Geogr. Rev.* **50** (1960), p. 125.

[22] Hartshorne, 'Perspective on the nature of geography,' pp. 161–2.

[23] Sauer, Carl O., "The education of a geographer," *Ann. Ass. Amer. Geogr.* **46** (1956), p. 298.

[24] Whitehead, Alfred North, 'Science and the modern world,' pp. 74–85, New York, Macmillan, 1925.

THE APPLICATION OF GEOGRAPHY IN POLAND

STANISŁAW LESZCZYCKI

GEOGRAPHICAL INVESTIGATIONS to meet national and social needs have a long history in Poland, and were numerous between the Wars. The latter, however, were of unequal value. Immediately after the First World War, attention was focused on the new political boundaries of a renascent Poland and on urgent tasks of reconstruction. Then came concentration on new political and economic needs. Some of these investigations, concerned with the development of neglected areas or with backward branches of the national economy, were valuable. But a few inspired by former governments for political ends—to justify a nationalistic policy aimed at minorities, for example, or in support of Polish colonial ambitions, or of Poland's claims to status as a leading European power—can be discounted. I have tried to assess the achievements of Polish geography between the Wars in other articles to which reference should be made.[1]

Cooperation between geographers and regional planning organizations in Poland began in 1933. This achieved useful results.[2] Geographers became aware of the practical value of geographical research in regional planning. They learnt planning techniques and planning methods. At the same time, they experienced the difficulties of carrying out regional planning under a capitalist system. The Second World War brought changes, not only in new boundaries and the acquisition of new territory but a revolutionary change in the whole socio-economic system, due to the socialization of the means of production and to the new status and role of science. Immediately the war ended Polish geographers, despite immense losses in men and material, joined forces to rebuild their university departments and, besides the reconstruction of the three pre-war departments of Warsaw, Cracow, and Poznań, built four new departments at Lublin, Wrocław, Łódź and Toruń. As early as 1945, all the university centres of geography were operating normally.

After the Second, as after the First, World War, Polish geographers played a part in the peace conferences,[3] defending Poland's western boundaries in the international arena,[4] and participating as experts in the delimitation of Poland's new frontiers.[5] They not only published many detailed studies of the geographical assets of the new territories, [6] but devoted much effort to ensuring that the Polish people as a whole were thoroughly familiar with them.[7] Later, geographers shared in the work of the Office of Settlement and Migration Studies and in that of the Scientific Council of the former Ministry for the Recovered Territories. This involved working out plans for rapid reconstruction, settlement and development[8]; the reorganization of geographical nomenclature, amounting to 32,000 place-names[9]; advising on new administrative divisions[10]; and the working out of new physical divisions for teaching.[11] They also took part in the work of the State Hydrological and Meteorological Institute in organizing the meteorological service, and in that of the State Geological Institute which was preparing geological survey maps of Poland on the 1:300,000 scale. As regional geographers, moreover, they shared in the work of the Western, Silesian, Baltic and other institutes. The valuable contribution made by Polish geographers in all these fields (assessed at the Fifth National Congress of Geographers at Lublin in 1954) was widely acclaimed.[12]

It was, however, in the field of physical planning that Polish geographers were

most successful. The task of rapid reconstruction was no longer, because of the socialization of the means of production, impeded as it had been before the War, and the introduction of a planned economy led to a vast expansion of the physical planning boards. These were not only efficiently organized but were financially endowed as well. Full of enthusiasm, geographers from the outset[13] took an active part in the replanning and the rebuilding of their devastated country. Nine worked in the Central Physical Planning Board, established in 1945; four headed regional planning boards; others worked in planning offices[14]; in all, thirty geographers were actively engaged in physical planning.

In the planning offices, geographers worked as regional specialists,[15] preoccupied mainly with environmental problems, or worked on population and settlement problems, or communications, or economic questions.[16] Some only of their reports have been published. Geographical studies at voivodeship level, utilizing pre-war experience and pre-war methods, were especially numerous. Through thus sharing in the work of the planning organizations, geographers gained first-hand knowledge not only of planning methods but of their implementation in practice. On the other hand, geographers had their own contribution to make, in providing subject matter and in the introduction of their own geographical methods. As a result of this co-operation, of general benefit to physical planning, several articles were published by geographers on the role of geographical research in physical planning.[17]

This was the situation up to 1949 when the fundamental process of immediate reconstruction was practically completed. Then came the Six Year Plan which was to form the foundation of a socialist system in Poland. For this, planning had to be adjusted and reorganized. Physical and economic planning boards were added to the State Economic Planning Commission. On the voivodeship level, Voivodeship Economic Planning Commissions were created. Finally, at the lowest level, Powiat Economic Planning Commissions were established. At the same time, regional planning concentrated on areas of vital economic importance. Making use of previous experience and taking account of additional criteria such as the size of investment expenditure and the time factor, twenty regional plans for smaller areas were devised. Geographers shared in this work also but to a lesser degree and mainly on a contract basis.[18] Economic geographers, on the other hand, versed in Marxism and socialist economics and in current economic requirements, began to play a leading role at this time. The part played by geography in physical planning and by geographers in regional planning can be studied in greater detail in the articles under reference.[19]

Polish geography underwent many changes during the period of the Six Year Plan, 1950–55. Marxist methodology was introduced. An appreciation of the role of geography during the inter-war and post-war periods was made. And planned geographical investigations began.[20] The First Polish Congress of Science in 1951 was the turning point because it was then that the first plan for geographical investigations on a national scale was adopted. True, there were some shortcomings but in general the resultant concentration on only a few selected geographical problems was beneficial to the future development of the subject as a whole.

Despite some considerable modifications, the 1951 plan remained of basic importance, especially from 1953 onwards when the self-supporting Institute of Geography of the Polish Academy of Sciences was founded[21] and took over the coordination and prosecution of scientific investigations from the Polish Geographical Society. These investigations included long-term projects, some to meet specific social needs,[22] and I would like to discuss a few of them briefly to illustrate how Polish geography has developed as an applied science in these conditions. The

geographical departments of the universities had been accustomed to produce studies on the basis of the powiat (county), the city, or the village unit, in the tradition of pre-war days. But the scope, the methods used, and the objectives of such studies varied considerably and in 1953 a Conference was convened in an attempt to rationalize them.[23] As a result it was agreed—though agreement was not unanimous—that their basic purpose should be to supply data for the promotion of the social and economic development of the unit in question, and that copies of all such studies should be sent to the appropriate planning authorities. Studies of cities and villages prepared on these lines showed that urban development could only be properly understood if the hinterland was simultaneously investigated. This led to the study of powiats within a single voivodeship[24] and ultimately to the study of a whole voivodeship, as a political and economic unit at a higher level. Work began in the Bialystok voivodeship, and then in the Warsaw, Olsztyn, Bydgoszcz and Lódź voivodeships.

The problem of the small towns in Poland now became an important issue for the Government, because of neglect or underdevelopment due to changed functions after the War; the pre-war functions of such small towns as centres of trade or handicraft, or as *entrepôts*, having almost disappeared. This was another problem which geographers, working with economists and sociologists, helped to solve.[25]

From 1946 onwards, geographers began preparing maps of land use in the form of field surveys on scales of 1:10,000 or 1:25,000, or land utilization maps based on existing topographical surveys, supplemented by air photographs. All the university geographical departments collaborated in this Land Utilization Survey of Poland and it was published in 1956.[26] Work on detailed land use surveys began in 1954[27] at the request of the planners,[28] the data being required by both planning and agricultural organizations. In 1951, a series of geomorphological maps (also under discussion since 1946)[29] was planned, on the scale of 1:300,000, the purpose of one of them, on the voivodeship of Bydgoszcz, being to apply the results of geomorphological research to agricultural requirements.[30] The general background of this problem was discussed in a special issue of the *Polish Geographical Review*.[31] Later, as the result of the combined efforts of the Geographical Institute, the Jagiellonian University, and local planning organizations, agreement was reached[32] on a detailed geomorphological map on a scale of 1:25,000 or 1:10,000. This, in classifying land forms, was to take account of planning and economic requirements in, for example, settlement planning, communications, regionalization of agriculture, location of industry, planning of residential areas and so on. Many parts of the country were soon covered by geomorphological maps, and these have become valuable basic documents for all regional planners. In so far as they also include in their classification the chronology of land forms, they provide complete data for morphogenetic studies.

In 1950, a series of hydrographic maps was contemplated, the problem of water resources being increasingly urgent with increasing urban and industrial expansion. For the planners, the provision of hydrographic maps was especially urgent and plans[33] were immediately made for detailed maps on scales of 1:25,000 or 1:50,000 which would depict all water resources in the context of a changed economic environment. The interests of the various bodies concerned—regional planning organizations and a planning institution like "Hydroprojekt," for example—were far from identical. Some attached more importance to underground water supply,[34] others to surface water (mountain streams), or to water pollution, fluctuations in level, floods, precipitation, etc.[35] However, agreement was reached in the end and work began, and approximately one-eighth of the country is now covered by hydro-

graphic maps. These, like the geomorphological maps, have become basic documents for all regional planners.

Associated with hydrographic mapping is the bathymetry of the Polish lakes, of which Poland has 9296 of over one hectare (2·5 acres) each in area. These reservoirs, covering in all some 317,000 hectares, have an important economic role, quite apart from the fact that they provide for inland fishing. Geographers have cooperated with hydrobiologists and with the fishery research institutes in these bathymetrical studies and have prepared a register[36] of more than 600 Polish lakes. Documentation on Polish lakes is centred on the Geographical Institute of the Academy of Sciences. Lakes, indeed, have come to be treated in Poland as a separate geographical unit and a new branch of research has developed, the physical geography of lakes.

Rapid urbanization was a feature of the period of the Six Year Plan. Urban population rose from 8,920,000 in 1949 to 12,067,000 in 1955 and industrial employment from 1,755,000 to 2,702,000 during these years. Cities expanded fast. New cities were built. City planning boards increased considerably, and geographers began to cooperate with them in the production of very detailed and accurate maps on scales of 1:5000 and 1:2000; geomorphological, hydrographical, hydrogeological and hypsometrical maps, for example; and maps showing relative altitudes, slopes, climate and so on. A special organization, "Geoprojekt," employed many geographers, and geographical memoirs, detailed studies of environment and physiography designed to aid the planned expansion of cities and settlements, grew rapidly in number. Generalized appreciations of geographical environment done from the point of view of urban investment gave rise to a process of academic synthesis and led to a new geographical discipline, urban physiography.[37]

With the emphasis increasingly on the effectiveness of economic investment, yet another branch of geographical science developed, the physiography of industrial location, and studies of urban functions formed the basis for the planning of urban networks, the development of conurbations, and even the development of particular towns.[38] Standards for the future development of towns were formulated in cooperation with the Architectural and Town Planning Institute.[39]

One aspect of climatological research neglected by geographers was the investigation of local climate. Research was therefore begun on local climatic characteristics, to establish criteria for the regional mapping of climate[40] in three types of environment: agricultural areas, industrialized urban areas, and health resorts. Climatological investigations in the Upper Silesian Industrial District[41] were the most productive and there atmospheric pollution appeared the most urgent problem. The results were published in the *Bulletins* of the Upper Silesian Industrial District Committee of the Polish Academy of Sciences,[42] as well as in other geographical publications. Climatic investigations of health resorts, carried out with the local climatological committee on the Ciechocinek model, are still in progress and will certainly contribute to the planned expansion of this resort.

The regional plan for the Upper Silesian Industrial District, approved in preliminary form in 1953, aims at speeding up the socio-economic development of Poland's most important economic region. At the request of the Government Praesidium, the Polish Academy of Sciences as a first step appointed a committee on the Upper Silesian Industrial District to conduct preliminary investigations in the following matters: (1) technological advances and mechanization to decrease employment, and waste of water and space by industrial establishments; (2) problems connected with faulting and subsidence; (3) intensification of agriculture; (4) local climate; (5) management and utilization of industrial waste; (6) improvements in, and coordination of, transport. The chairman of this Committee is a geographer,

and geographers, engaged in investigating environmental changes, are included in its membership.[43, 44] The object of the Committee's investigations was to improve living conditions by restoring the destroyed geographical environment. Some of these investigations, published in the Committee's *Bulletins*[45] have already been put to practical use.

The Six Year Plan completed, a new planning phase started in 1956, with the reorganization of the Planning Commission of the Council of Ministers and the appointment of working bodies such as the Long-Term Central Planning Commission, as well as other special commissions such as the Commission for Long-Term Regional Planning. These commissions, to which geographers were appointed, together with the Long-Term Planning Departments of the Planning Commission of the Council of Ministers, are working out basic principles for an even longer-term plan, of fifteen years, up to 1975. In their tasks of assessing regional plans, localization of major investment, production and services, the geographers are adding to their knowledge of national economic planning.

At the same time, the principle of decentralization was introduced into State planning, and voivodeship regional planning centres were strengthened. Voivodeships became increasingly to be treated as separate economic regions, the study of which involved the cooperation of geographers. In addition, the Voivodeship People's Councils, concerned with economic and social development, appointed economic and scientific committees which also include geographers.

The inadequacy of current theories governing spatial and regional economics led the Praesidium of the Polish Academy of Sciences to appoint the Committee for Space Economy and Regional Planning, the chairman and eight members of which are geographers. As a result, geographers saw new possibilities of investigating spatial economy in connection with the rational exploitation and local transformation of geographical environment. At the same time, methods were established to determine regional differences in socio-economic structure and to formulate principles governing the development of an economic region, special attention being paid to the most rational location of investment in industry and in communications, and to the planning of settlement networks through a definition of the functions of individual settlements. The Committee also concerned itself with the regionalization of agriculture and the distribution of service centres.

The geographical distribution of labour in socialist countries is generally a matter for the Council for Mutual Economic Aid, which agrees plans for the economic development of adjoining territories; Poland and Czechoslovakia, for example. Geographers share in these studies also and although they are still at an early stage, they offer exceedingly attractive prospects for participation by geographers in regional planning on an international scale.

Observations of regional differences in socio-economic structure caused by new investment, and the social and economic complications caused through lack of harmony in investment policies, show that regional planning can only be conducted in terms of actually existing economic regions. In fact, the whole problem of economic regions is obscure and there is a wide diversity of view. However, this problem must be settled if regional planning is to speed up general development. Since economic regions have not been finally defined, the voivodeship has been accepted as the basis for long-term planning. The voivodeship, an administrative unit, has thus temporarily been identified by the planners with an economic region. To meet the needs of long-term national planning, attempts have also been made to group several voivodeships together into "regions,"[46] though they are obviously based on subjective criteria.

Geographers, meanwhile, have been trying to investigate actual and real economic

regions. These, however, do not correspond to the political administrative divisions of the country nor, being of different types and different sizes, can they always be graded like administrative units such as voivodeships, powiats, or gromadas (communities). Studies have also been undertaken of the structure of some larger cities, and of their influence as socio-economic centres,[47] as well as of the regional economic structure of various voivodeships,[48] and of inter-regional ties.[49]

One can see from this review how extensive the work of Polish geographers has been in the interest of State and Society. This work, however, has by no means been wholly of an "applied" character and that is why it is so difficult to draw the line between purely scientific and practical investigations. One thing is certain. If geographical investigations are to have any practical value, they must be not only qualitative but also quantitative so that they can be put to direct practical use. Here Polish geography has some achievements to its credit. These are based on the following premises:—

(1) A real understanding of the needs of State and Society, and an intention that geographical studies should contribute to these needs. On the other hand, geographers, with their intellectual approach, know well that this does not mean that their work must be confined to a narrow, practical groove, or that it must be of an exclusively "applied" character. Indeed, proof of this lies in the increasing specialization of Polish geographers which is becoming more and more marked, allowing not only for research of a more fundamental kind, but for a greater realism.

(2) The need rapidly to reconstruct the social and economic life of Poland and to accelerate development caused government and other organizations to assign to geographers many concrete and current tasks of research.

(3) After the Liberation of Poland in 1945, geographers immediately took part in official and institutional research and often worked as permanent staff. In this way they gained first-hand knowledge of the social and economic problems involved in the rebuilding of Poland, and in the methods to be used; for example, in regional planning.

(4) Not only was the work of geographers carefully scrutinized by the institutions by which they were engaged, but their proposals and suggestions were put into practice.

There can be no doubt that the planning of geographical investigations, designed to provide answers to urgent current problems, was of value. For one thing, it resulted in cooperation between the various university centres of geography, and even in joint action. The coordination of planning, first by the Polish Geographical Society and later by the Institute of Geography of the Academy of Sciences, was also very valuable. Finally, through the collaboration of geographers with representatives of other sciences, the status of geography was generally enhanced. Geography is thus prospering in post-war Poland and its authority as a science is growing. The fact that their work is not only widely discussed but is tested in practice has led to a sense of greater responsibility on the part of Polish geographers. Cooperation with various State institutions has led to new concepts of research being evolved which have enriched the subject. The knowledge that their work would be tested in practice has also made the work of geographers more precise and more realistic, and has led to the expansion of laboratory facilities of many kinds. Just as greater precision has given geography greater practical value, so it has also provided new elements for generalization. This in turn has given a greater scientific profundity to geographical theory. Through its application to the practical problems of life, Polish geography is not only widening the sphere of its scientific work. It is increasing the precision of its methods of research and the depth of its fundamental theories.

REFERENCES

Articles are in Polish unless stated otherwise. Those with an English summary or notes are marked ES., with a French summary, FS.

Certain papers read at the Anglo-Polish Seminar at Nieborow, 14–18 September 1959, are to be published in a special issue of Geographical Studies by the Institute of Geography, Polish Academy of Sciences, in English. These references will be abbreviated: *Geogr. Stud.* (*A.-P. Sem. 1959*), with *English* understood.

[1] Leszczycki, S., "The present state of geography in Poland and the prospects of its development," *Przegl. geogr.* **23** (1953), pp. 3–54. ES.

[2] Dziewoński, K., "Geographical research for regional planning in Poland," *Geogr. Stud.* (*A.-P. Sem. 1959*) Kiel: in the press.

[3] Leszczycki, S., "Establishment of the present boundaries of Poland," *Przegl. geogr.* 20 1946), pp. 154–7; *Przegl. Zach.* **1**, 4/5 (1945), pp. 181–5.

[4] Kiełczewska, M., A. Grodek, "Odra-Nysasa, the best boundary of Poland," *Prace Inst. Zach.* No. 1, Poznań, 1946; M. Kiełczewska, L. Gluck, Z. Kaczmarczyk, "For the left Odra bank," *Prace Inst. Zach.*, No. 5, Poznań, 1946; A. Zierhoffer, "The problem of the western Polish boundary," *Przegl. Zach.* **2** (1946), pp. 107–117; A. Zierhoffer, "Problem of the western boundary of Poland in the light of political geography," *Przegl. Zach.* **3**, 3 (1947), pp. 203–12.

[5] Pietkiewicz, S., "Some remarks on boundaries and delimitation," *Przegl. geogr.* **20** (1946), pp. 9–53; "The eastern boundary of Poland," *Przegl. geogr.* **21**, 3/4 (1947), pp. 369–73. ES.

[6] Czyżewski, J., "Contribution to the cartometric analysis of political boundaries of Poland," *Przegl. geogr.* **22** (1948–9), pp. 59–81; R. Galon, "The connections and role of Poland in the basin of the Baltic Sea," *Jantar*, **1** (1948), pp. 24–30; M. Kiełczewska, "Geographical bases of Poland," *Prace Inst. Zach.* No. 10, Poznań 1946; S. Leszczycki, "The geographical bases of contemporary Poland," *Journal of Central European Affairs Colorado* **7**, 4 (1948), pp. 357–73, *English*; S. Leszczycki, "Geopolitical significance of the Recovered Territories for Poland and the Slavonic countries," *Zycie Słowiańskie*, 1946, a special issue in seven languages; S. Srokowski, "Elements of the geopolitical situation of Poland," *Problemy* No. 8/9 (1947), pp. 461–6.

[7] Dylik., J, 'Geography of the Recovered Territories,' Warsaw, 1946, Książka; B. Krygowski, S. Zajchowska, 'The Lubuska land; a geographic and economic description,' The Western Institute, Poznań, 1946; S. Srokowski, 'Western Pomerania,' The Baltic Institute, Bydgoszcz, 1947; S. Srokowski, 'Eastern Prussia; a geographic, economic and social study,' The Baltic Institute, Bydgoszcz, 1945; A Wrzosek, 'On the Odra and Nysa: geographic-economic description of the recovered Silesian lands' (Ed. The Silesian Institute), Katowice, 1945; J. Zaremba (Ed.) 'Atlas of the Recovered Territories,' 43 maps, 1:2M, Central Office for Physical Planning, Warsaw, 1947, ES.; 'Monograph of the Odra River: a collective study,' Western Institute, Poznań, 1948; 'The visage of the Recovered Territories: Lower Silesia,' 2 vols. Książnica-Atlas, Warsaw, 1948; 'Silesia: land and people,' The Silesian Institute, Wrocław, 1948; 'Old-Polish lands,' Western Institute, Poznań: Vol. 1: 'Lower Silesia,'1948; Vol. 2: Western Pomerania, 1949; Vol. 3: 'The Lubuska land,' 1950; Vol. 4: 'Warmia and Mazury,' 1953.

[8] Jahn, A., "Overpopulated agricultural areas in Poland as the source of settlers for the Recovered Territories," Third Session of the Scientific Council for the problems of the Recovered Territories, 13 June 1946; S. Pietkiewicz, M. Orlicz, "Regional plan of migration of agricultural settlers on the Recovered Territories," First Session of the Scientific Council for the economic development of the Recovered Territories, 30 July–7 August 1945, No. 3.

[9] Rospond, S., 'Dictionary of geographical names of western and northern Poland,' 2 vols., Polish Geographical Society, Warsaw, 1951; S. Srokowski, "Action aiming at the restoration of Polish place-names in the Recovered Territories," *Przegl. geogr.* **22** (1948/9), pp. 305–9.

[10] Barciński, F., "Should the Lubuska Land constitute a separate voivodeship?" *Przegl. Zach.* No. 4 (1948), pp. 407–13; S. Leszczycki, J. Langrod, "Remarks on the project of the new administrative division of the country," *Gazeta administracyjna* **22**, 7/8 (1947), pp. 344–350; A. Wrzosek, "On the changes in the administrative division of the Recovered Territories," First Session of the Scientific Council for the economic development of the Recovered Territories, 30 July–7 August 1945, No. 3.

[11] Galon, R., "The division of northern Poland into natural regions," *Czas. geogr.* **18** (1947) pp. 113–22, ES.; J. Kondracki, "Natural regions of Poland, the report on the conference on the division of Poland into natural regions," *Czas. geogr.* **17**, 3/4 (1939/46), pp. 280–98; M. Klimaszewski, "Morphological division of southern Poland," *Czas. geogr.* **17** (1946), pp. 133–

182; S. Pietkiewicz, "Morphological division of northern and central Poland," *Czas. geogr.* **18** (1947), pp. 123–69.

[12] Leszczycki, S., "The achievements of Polish geography and its further ways of development in the People's Poland"; R. Galon, "The development of physical geography during the decade of the People's Poland"; J. Kostrowicki, "The development of economic geography between 1945 and 1954"; K. Dziewoński, "Geographic studies for planning purposes between 1945 and 1954"; R. Galon, "Regional geographic monographs published between 1945 and 1954"; S. Pietkiewicz, "Polish cartography between 1945 and 1954." All in *Przegl. geogr.* **26**, 3 (1954), pp. 3–122, ES.

[13] Zaremba, J., "The role of geography in physical planning," *Przegl. geogr.* **21**, 3/4 (1947), pp. 333–40, ES.

[14] Jahn, A., "Geography in the planning offices of Poland," *Czas. geogr.* **17**, 3/4 (1939/46), pp. 205–12, FS.

[15] A collective study of 'The Lublin Region, I,' Ministry of Reconstruction, Warsaw, 1947; K. Dziewoński, R. Galon, J. Kostrowicki, 'National Plan I,' Warsaw, 1947.

[16] Chmielewski, J., J. Zaremba (Ed.), 'Studies for the National Plan,' Central Physical Planning Board (with Atlas in two vols.), Warsaw, 1947 and 1948, ES.

[17] Berezowski, S., "Geographical studies in physical planning," *Gosp. Planowa* No. 4/5 (1948); K. Bromek, "The role of geography in physical planning," *Biul. geogr. Krak. Odd. PTS* No. 1, (1947), pp. 6–9; K. Dziewoński, "Geographical studies for regional planning," *Przegl. geogr.* **25**, 4 (1953), pp. 3–11, ES.; J. Zaremba, "The use of studies for physical planning," *Czas. geogr.* **18**, 1/4 (1947), pp. 232–8.

[18] List of synthetic regional studies on Polish Territories done in the years 1928–57. Publications of the Perspective Regional Planning: Planning Commission of the Council of Ministers, No. 3, Warsaw, 1957.

[19] Kostrowicki, J., and S. Leszczycki, "Contribution of geography to planning in Poland," *Przegl. geogr.* **28**, Supplement (1956), pp. 19–25, *English*; J. Kostrowicki, "The conference of the Polish Geographical Society on the studies of regional plans" (Cracow, 17–18 January 1953), *Przegl. geogr.* **25**, 4 (1953), pp. 91–5.

[20] Leszczycki, S., "Present tasks of geography" (a summary of the paper read at the all-Polish meeting of geographers in Gdańsk on 5 June 1949), *Geografia w Szkole* No. 4/5 (1949), pp. 1–20.

[21] Leszczycki, S., "Five years' activity of the Institute of Geography of the Polish Academy of Sciences 1953–8," *Przegl. geogr.* **31** (1959), Supplement, pp. 3–20, *English*.

[22] Leszczycki, S., "National plan of geographical research in Poland 1956–60," *Przegl. geogr.* **28** (1956), Supplement, pp. 3–9, *English*.

[23] Kostrowicki, J., "Conference on Polish geography and on geographical monographs of towns," *Przegl. geogr.* **25**, 4 (1953), pp. 96–107.

[24] An issue of *Przegląd Geograficzny* concerned with the problems of the Bialystok voivodeship: vol. **29**, 3 (1957), pp. 449–678, ES.

[25] Kiełczewska-Zaleska, M., "The crisis of small towns and the problem of their activization," *Zycie Gospodarcze*, (1956), pp. 292–7; *and* J. Kostrowicki, "The problem of activization of small towns in Poland," *Nowe Drogi* No. 7/8 (1956), pp. 31–47; J. Kostrowicki, "Small towns in Poland and their problems," *Przegl. geogr.* **25**, 4 (1953), pp. 12–52, ES.; A. Kukliński, "Experiences with the studies on the possibility of activization of small towns regarded as county centres in the Poznań voivodeship," *Przegl. geogr.* **25**, 4 (1953), pp. 53–64; K. Dziewoński, M. Kiełczewska-Zaleska, L. Kosiński, J. Kostrowicki, S. Leszczycki (Eds.), "Geographical studies on the activities of small towns," Institute of Geography (Polish Academy of Sciences), Geographical Studies No. 9, Warsaw, 1957.

[26] Uhorczak, H. (Ed.), 'General land utilization map of Poland,' scale of 1:1M. Institute of Geography PAN, Warsaw, 1947, ES.

[27] Bromek, K., "The preparation of a detailed land utilization map for the city of Cracow," *Przegl. geogr.* **25**, 3/4 (1955), pp. 589–604, ES.

[28] Dziewoński, K., "Detailed survey of land utilization in Poland," *Przegl. geogr.* **28** (1956) Supplement, pp. 26–31, *English*; J. Kostrowicki, "Research studies on land utilization in Poland," *Przegl. geogr.* **31**, 3/4 (1959), pp. 517–33, ES.; J. Kostrowicki, "Polish Land Utilization Survey," *Geogr. Stud.* (*A.-P. Sem. 1959*): in the press.

[29] Jurczyński, J., "Cartes morphologiques générales de la Pologne," *Przegl. geogr.* **25**, 3 (1953), pp. 3–15, FS.; J. Dylik, "Problème de la polygénèse du relief dans les travaux sur la carte géomorphologique de la Pologne," *Przeg. geogr.* **25**, 3 (1953), pp. 69–78, FS.; M. Klimaszewski, "The problem of the geomorphological field mapping of Poland," *Przegl. geogr.* **25**, 3 (1953), pp. 16–32, ES.

[30] Galon, R., and S. Roszkówna, "The general geomorphological map of the Bydgoszcz district," *Przegl. geogr.* **25**, 3 (1953), pp. 79–91, ES.

[31] Dylik, J., "Geomorphological problems as related to agricultural needs," *Przegl. geogr.* **26**, 4 (1954), pp. 4–36, ES.; R. Galon, "An experimental interpretation of the geomorphological map of the Bydgoszcz voivodship from the point of view of the regionalization of agricultural production," *Przegl. geogr.* **26**, 4 (1954), pp. 48–53, ES.; L. Starkel, "The significance of the geomorphological map for agriculture," *Przegl. geogr.* **26**, 4 (1954), pp. 198–212.

[32] Klimaszewski, M., "The principles of geomorphological survey of Poland," *Przegl. geogr.* **28** (1956) Supplement, pp. 32–40, *English.*

[33] Klimaszewski, M., "The detailed hydrographical map of Poland," *Przegl. geogr.* **28** (1956) Supplement, pp. 41–7, *English.*

[34] Werner-Więckowska, H., "The aims and methods of geographical investigations of ground-water," *Przegl. geogr.* **26**, 2 (1954), pp. 106–36, ES.

[35] Pietkiewicz, S., "Observations concerning the problems of the hydrographical map of Poland," *Przegl. geogr.* **27**, 2 (1955), pp. 325–32, ES.

[36] Kondracki, J. and S. Majdanowski (Eds.), 'Catalogue of the Lakes of Poland,' Institute of Geography PAN, *Dokumentacja Geograficzna*, Warsaw, 1954; S. Majdanowski, "The lakes of Poland," *Przegl. geogr.* **26**, 2 (1954), pp. 17–50.

[37] Domosławska, M. D., "The scope of urban physiography," *Przegl. geogr.* **24**, 1/2 (1952), pp. 84–9, ES.; K. Dziewoński, "A new branch of geographic research—urban physiography," *Przegl. geogr.* **27**, 3/4 (1955), pp. 489–500, ES.; W. Różycka. "Scope and aims of urban physiography," *Przegl. geogr.* **27**, 3/4 (1955), pp. 501–21, ES.; a special conference on urban physiography has been held, and reports are published in *Przegl. geogr.* **27**, 3/4 (1955), ES.

[38] Kostrowicki, J., "Basic functions of towns," *Przegl. geogr.* **24**, 1/2 (1952), pp. 7–64, ES.; L. Kosiński, "On the functional structure of Polish towns," *Przegl. geogr.* **30**, 1 (1958), pp. 59–96, ES.; L. Kosiński, "Problems of the functional structure of Polish towns," *Przegl. geogr.* **31** (1959) Supplement, *English.*

[39] Kosiński, L., "Urban geography in Poland and its connections with practice," *Geogr. Stud.* (*A.-P. Sem. 1959*): in the press.

[40] "Z.K. Climatological Conference in Wrocław (26–27 March 1954)," *Przegl. geogr.* **27**, 1 (1955), pp. 226–33.

[41] Paszynski, J., "Investigation of local climate in the Upper Silesian Industrial District," *Geogr. Stud.* (*A.-P. Sem. 1959*): in the press.

[42] Paszynski, J. (Ed.), Bulletin of the Committee for the Upper Silesian Industrial District (GOP): Commission on Climate, No. 2 "Upper winds in Katowice, the sphere of air pollution caused by G.O.P., dust sedimentation in the environs of electrical works," 1956; No. 10 "Air pollution in the G.O.P. area," 1957.

[43] Leszczycki, S., 'Problems of the Upper Silesian Industrial District,' Polish Academy of Sciences, Katowice, 1959: The Silesian Scientific Institute, Bulletin, No. 12.

[44] Klimaszewski, M., "The problems of the geomorphological and hydrographical map on the Upper Silesian Industrial District," *Geogr. Stud.* (*A.-P. Sem. 1959*): in the press.

[45] The Committee of the Upper Silesian Industrial District of the Praesidium of the Polish Academy of Sciences, published in the years 1955–9, 31 issues of the Bulletin.

[46] Berezowski, S., "The division of Poland into economic regions," *Gospod. Planowa* **14**, 3 (1959), pp. 56–63; K. Dziewoński, "Some problems of research for economic regionalization of Poland," *Przegl. geogr.* **29**, 4 (1957), pp. 719–39, ES.; K. Secomski, 'Introduction to the theory of the distribution of produce forces,' Polskie Wydawnictwa Gospodsarcze, Warsaw, 1956; B. Rychlowski, "Podzial Polski na regiony ekonomiczne," *Gospod. Planowa* **15** (1960) pp. 43–7.

[47] Mańkowska, S., "Commutation as a problem of suburban zones," *Przegl. geogr.* **31**, 1 (1959), pp. 33–48, ES.; L. Straszewicz, "The Łódź industrial complex," *Przegl. geogr.* **29**, 4 (1957), pp. 741–77, ES.; L. Straszewicz, "The Łódź industrial district as a subject of investigation of economic geography," *Przegl. geogr.* **31** (1959) Supplement, *English.*

[48] Wróbel, A., "The Warsaw voivodeship: an economic study of the regional structure," *English.* Geographical Studies, Institute of Geography (Polish Academy of Sciences): in the press.

[49] Wróbel, A., "Investigations of passenger traffic as a method of delineating service regions," *Przegl. geogr.* **31**, 1 (1959), pp. 119–27, ES.; A. Wróbel, "Service regions of the centres of higher education in Poland," *Przegl. geogr.* **31**, 1 (1959), pp. 129–35, ES.; Polish studies on these lines were summed up at the International Conference on economic regionalization organized by the Institute of Geography, Polish Academy of Sciences, in 1959 at Kazimierz. A report on the conference will be published as a special volume of the Geographical Studies of the Institute.

GEOGRAPHY IN GREAT BRITAIN 1956–60

A REPORT SUBMITTED TO THE XIXTH INTERNATIONAL GEOGRAPHICAL CONGRESS, STOCKHOLM, AUGUST 1960

K. C. EDWARDS AND G. R. CRONE

SINCE THE REPORT on the progress of geography in Great Britain prepared by Prof. J. A. Steers for the Congress at Rio de Janeiro in 1956, considerable developments have taken place. Departments of Geography have shared in the general university expansion over this period and the number of teaching and research posts has continued to grow. An important and highly satisfactory feature of this expansion has been the substantial increase in postgraduate work.

In keeping with these academic developments, improved accommodation for geography has been provided in a number of universities. In several cases, *e.g.* Birmingham, Exeter, Nottingham, Swansea, entirely new buildings have been or are about to be completed, while at Belfast the department has moved to more spacious quarters and has been partly re-equipped. Elsewhere improved facilities have enabled laboratories for cartography, photogrammetry and soil science to be planned.

There have been considerable changes among the professorial posts as well as the establishment in 1956 of a new chair in the University of Durham (Durham division) to which Prof. W. B. Fisher was appointed. In 1957 Prof. R. F. Peel moved to Bristol University from Leeds University where he was succeeded by Prof. R. E. Dickinson, while Prof. R. W. Steel was appointed to the chair at Liverpool, left vacant by the death of Prof. Wilfred Smith. In 1958 Prof. H. R. Wilkinson was appointed at Hull, while the same year brought the retirement of Prof. L. Dudley Stamp after a long and distinguished career at the London School of Economics and Political Science, where he was succeeded by Prof. M. J. Wise. In recognition of his outstanding services both to geography and to his university, Prof. Stamp was made Emeritus Professor of the University of London. Though having retired from his teaching appointment, Prof. Stamp remains as active as ever in promoting the interests of geography in Great Britain and abroad. In 1959 Prof. D. L. Linton moved to Birmingham following the retirement of Prof. R. H. Kinvig and was succeeded at Sheffield by Prof. C. A. Fisher. Among senior university posts, four new Readerships have been created. Those at Exeter, Sheffield and the London School of Economics were conferred upon Dr. A. H. Shorter, Dr. Alice Garnett and Dr. E. Jones respectively, while Mr. E. M. Rawstron of Nottingham was appointed to the other at Queen Mary College, London.

Among the various honours received by British geographers during the period, the highest academic distinction was that conferred upon Prof. S. W. Wooldridge by his election in 1959 as a Fellow of the Royal Society. In 1959 Professor L. Dudley Stamp received an Honorary Degree from the Handelshögskolan i Stockholm.

Unhappily the deaths of several distinguished geographers occurred during the past four years: Prof. R. N. Rudmose Brown in 1957, Prof. H. H. King in 1958, Prof. W. W. Jervis in 1959 and Mr. G. J. Cons of Goldsmiths' College, London, early in 1960.

From time to time senior geographers were consulted by government departments, while others continued to serve on advisory committees to which they had been

appointed prior to 1956. Prof. L. D. Stamp was appointed a member of the Royal Commission on Common Land, the Report of which was published in July 1958 (H.M.S.O.). To this Report Prof. Stamp contributed an appendix of eighty-two pages on the geographical distribution of common land. Nor are these services confined to the home country, for Mr. B. H. Farmer was a member of the Ceylon Land Commission from 1955 to 1958. Other geographers following careers in government service have obtained leading positions. In the Ministry of Housing and Local Government, for example, Mr. J. R. James, who in 1956 was awarded the O.B.E. in recognition of his services to planning research, is now Deputy Chief Planner, Dr. E. C. Willatts (awarded the O.B.E. in 1960) Principal Planner and Mr. A. G. Powell Senior Research Officer (London Region).

The Nature Conservancy, founded in 1949, continued to give encouragement to geography both through the character of its investigations and by the provision of research posts open to geographers. For the training of specialists in this field mention should be made of the new one-year postgraduate diploma course in Conservation starting this summer at University College London. This course, which includes instruction and field work in geography, botany and zoology, is being run in cooperation with the Nature Conservancy. It should be noted too that geographers at the Queen's University, Belfast, have served on the Northern Ireland Committee for Nature Conservation.

A new body called the British Universities Geomorphological Research Group has recently been established under the chairmanship of Prof. D. L. Linton, with Mr. R. A. Savigear as secretary. Its purpose is to extend the work of the Land Form Survey initiated some years ago under the auspices of the Geographical Association, and eventually to produce a series of morphological maps. As a beginning, the Research Group has set up three committees to examine (*i*) the problems of field identification, symbols and scale of mapping, (*ii*) methods of training and (*iii*) problems of compilation and reproduction.

A new Land Use Survey of England and Wales has been started through the initiative of Miss Alice Coleman and Mr. K. R. Maggs. The aim is to record, through the help of voluntary workers in each county, land use categories on the 1:25,000 sheets of the Ordnance Survey and afterwards to publish maps printed in nine colours. It is intended to differentiate land use categories in considerably greater detail than in the case of the well known Survey carried out in the 'thirties under the direction of Prof. L. D. Stamp.

In the past few years a notable contribution to our knowledge of ancient settlement in northern Britain has been made by students of Aberdeen University in the course of field research in Shetland under the direction of Prof. A. C. O'Dell. During excavations on St. Ninian's Isle in 1958, treasure was found constituting the largest collection of early British silverware ever discovered in Scotland. The site itself has been occupied since Bronze Age times, while the treasure included objects of ecclesiastical use which were buried for preservation about 800 A.D. at the time of the Norse occupation. The excavations are to be continued.

Research and Publications

The following sections of this report deal with research completed during the period under review, together with lists of publications which, it is hoped, satisfactorily reflect the nature of the work mentioned under each section. It is obviously impossible to include more than a representative selection of all that has been published. (The figure following the date is the volume number.)

I. Physical Geography

Meteorology and Climatology

The scope of studies undertaken in meteorology and climatology is indicated by the list of published books and papers. Work has also been pursued on high-level climatology and land forms (C. A. Halstead) and on the classification of climates, while a survey of the climate of London has been initiated (T. J. Chandler).

Books

Miller, A. A. and Parry, M. Everyday meteorology, 1958.
Taylor, J. A. and Yates, R. A. British weather in maps, 1958.

Papers

General

Hannell, F. G. Climatic fluctuations in Bristol. *Adv. Sci.* 1956. 12
Manley, G. Climatic fluctuations and fuel requirements. *Scottish G. Mag.* 1957. 73
Barnes, F. A. The high summers of 1954 and 1955 and long waves in the westerlies. *E. Midland G.* 1956
Ashwell, I. Y. and Hannell, F. G. Wind and temperature variations at the edge of an ice-cap. *Met. Mag.* 1960. 89
Halstead, C. A. Climatic observations in Scotland. *Scottish G. Mag.* 1956. 72
Hanwell, F. G. Meteorological factors in the central desert of Iceland. *Met. Mag.* 1959. 88
Parry, M. Local temperature variations in the Reading area. *Q.J.R. Met. Soc.* 1956. 82

Rainfall

Beckinsale, R. P. The nature of tropical rainfall. *Trop. Agric.* 1957. 34
Gregory, S. Annual rainfall probability maps of the British Isles. *Q.J.R. Met. Soc.* 1957. 83
Gregory, S. Regional variations in the trend of annual rainfall over the British Isles. *G.J.* 1956. 122

Evapotranspiration

Crowe, P. R. Some further thoughts on evapotranspiration, a new estimate. *Geog. Stud.* 1959. 4
Howe, G. M. The moisture balance in England and Wales based on the concept of potential evapotranspiration. *Weather* 1956
Manley, G. The revival of climatic determinism. *Geog. Rev.* 1958. 48

Geomorphology

The breadth of interests exhibited by British geomorphologists is amply shown by the list of publications. Among more recent activities is the increasing interest taken in hydrological problems; work has been done on the River Findhorn, the Tyne, parts of the Trent and the westward-flowing streams of central Wales, while the hydrological laboratory established on the Thames under the direction of Prof. A. A. Miller should also be mentioned. Coastal investigations have been continued, especially in East Anglia by members of the department at Cambridge, and at Spurn Point and in Lincolnshire by research teams from Hull and Nottingham respectively, while Nature Conservancy's physiographic unit has been active on other portions of the coast. A new wave tank has been installed at Cambridge where increasing use is also being made of ciné-photography in experimental work.

Books

Dury, G. H. The Face of the Earth, 1959
Monkhouse, F. J. Landscape from the Air, 1959
King, C. A. M. Beaches and Coasts, 1959
Sparks, B. W. An Introduction to Geomorphology, 1960
Williams, W. W. Coastal change, 1960

Papers

Development of landscape and denudation chronology

Bird, E. C. F. Some aspects of the geomorphology of the High Weald. *Trans. I.B.G.* 1958. 25

Brown, E. H. The physique of Wales. *G.J.* 1957. 123
Coleman, A. The terraces and antecedence of a part of the River Salzach. *Trans. I.B.G.* 1958. 25
Driscoll, E. M. The denudation chronology of the Vale of Glamorgan. *Trans. I.B.G.* 1958. 25
Everard, C. E. Erosion platforms on the borders of the Hampshire basin. *Trans. I.B.G.* 1956. 22
Linton, D. L. and Moisley, H. A. The origin of Loch Lomond. *Scottish G. Mag.* 1960. 76
Rice, R. J. The erosional history of the Upper Wye basin, central Wales. *G.J.* 1957. 123
Sealy, K. R. The terraces of the middle Thames. *Proc. Geol. Assn.* 1956
Soons, J. M. Landscape evolution in the Ochil Hills. *Scottish G. Mag.* 1958. 74
Sparks, B. W. The evolution of the relief of the Cam valley. *G.J.* 1957. 123
Waters, R. S. Differential weathering and erosion on oldlands. *G.J.* 1957. 123

Drainage development

Embleton, C. Some stages in the drainage evolution of part of North East Wales. *Trans. I.B.G.* 1957. 23
Linton, D. L. The Sussex rivers. *Geog.* 1956. 41

Rivers

Dury, G. H. Analysis of regional flood frequency on the Nene and the Great Ouse. *G.J.* 1959. 125
Dury, G. H. Misfit streams: problems in interpretation, discharge and distribution. *Geog. Rev.* 1960. 50
Baird, P. D. and Lewis, W. V. The Cairngorm floods, 1956. *Scottish G. Mag.* 1957. 73

Geomorphology in arid and semi-arid areas

Balchin, W. G. V. and Pye, N. Piedmont profiles in the arid cycle. *Proc. Geol. Assn.* 1956. 66
Grove, A. T. Geomorphology of the Tibesti region with special reference to Western Tibesti. *G.J.* 1960. 126
Grove, A. T. The former extent of Lake Chad. *G.J.* 1959. 125

Limestone geomorphology

Sweeting, M. M. Karstlands of Jamaica. *G.J.* 1958. 124
Coleman, A. M. and Balchin, W. G. V. The origin and development of surface depressions in the Mendip Hills. *Proc. Geol. Assn.* 1959. 70

Slopes

Pallister, J. W. Slope development in Buganda. *G.J.* 1956. 122
Palmer, J. Tor formation at the Bridestones in North-east Yorkshire etc. *Trans. I.B.G.* 1956. 22

Periglacial phenomena

Fitzpatrick, E. A. An introduction to the periglacial geomorphology of Scotland. *Scottish G. Mag.* 1958. 74
Williams, P. J. Some investigations into solifluction features in Norway. *G.J.* 1957. 123

Fluvio-glacial features

Peel, R. F. The profiles of glacial drainage channels. *G.J.* 1956. 122
Sissons, J. B. Sub-glacial stream erosion in South Northumberland. *Scottish G. Mag.* 1958. 74
Yates, E. M. and Moseley, F. Glacial lakes and spillways in the vicinity of Madely, N. Staffs. *Q.J. Geol. Soc.* 1958. 113

Glacial deposits and morphology

Clayton, K. M. The glacial deposits of Essex. *Proc. Geol. Assn.* 1957. 68
Clayton, K. M. and Brown, J. C. The glacial deposits around Hertford. *Proc. Geol. Assn.* 1958. 69
Farrington, A. The Lee Basin, Part I: Glaciation. *Proc. R. Irish Acad.* 1959. 60 B 3
Linton, D. L. Radiating valleys in glaciated lands. *Tijds. K. Nederl. Aardrijksk. Gen.* 1957. 74
Linton, D. L. Morphological contrasts of East and West Scotland. 1959 (In 'Geog. Essays in memory of A. G. Ogilvie')
Sissons, J. B. The deglaciation of part of E. Lothian. *Trans. I.B.G.* 1958. 25
Straw, A. The glacial sequence in Lincolnshire. *E. Midlands G.* 1958. 9

Glaciology

Groom, G. Niche glaciers in Bunsow Land, Vestspitsbergen. *J. Glaciol.* 1959. 3
Lister, H. and Wyllie, P. J. The geomorphology of Dronning Louise Land. *Meddelelser om Grønland* 1957. 158
Lister, H. and Pratt, G. Geophysical investigations of the Commonwealth Trans-Antarctic Expedition. *G.J.* 1959. 125
Lister, H. Mass balance of Antarctica. *Geophys. J.* 1959
Lister, H. and Stephenson, P. J. Preliminary results of the glaciological work on the Trans-Antarctic Expedition 1955–1958. *J. Glaciol.* 3

Coastal geomorphology

Gresswell, R. K. The post-glacial raised beach in Furness and Lyth, North Morecambe Bay. *Trans. I.B.G.* 1958. 25
Kidson, C., Carr, A. P. and Smith, P. D. Further experiments using radio-active methods to detect the movement of shingle over the sea bed and alongshore. *G.J.* 1958. 124
Kidson, C. and Carr, A. P. The movement of shingle over the sea bed and close inshore. *G.J.* 1959. 125
Stevens, N. Some observations on the interglacial platform and the early post-glacial raised beach on the east coast of Ireland. *Proc. R. Irish Acad.* 1957. 58 B
Sweeting, M. M. Valleys and raised beaches in Bunsow Land, central Vestspitsbergen. *Norsk Polarinst. Skr.* 1958. 115
Walton, K. Rattray: a study in coastal evolution. *Scottish G. Mag.* 1956. 72
Williams, W. W. An east coast survey: some recent changes in the coast of East Anglia. *G.J.* 1956. 122

Techniques

Chorley, R. J. Aspects of the morphometry of a poly-cyclic drainage basin. *G.J.* 1958. 124
Clarke, J. I. and Orrell, K. An assessment of some morphometric methods. *Univ. Durham Occas. Papers* 1958. 2
Waters, R. S. Morphological mapping. *Geog.* 1958. 43
Chorley, R. J. and Morley, L. S. D. A simplified approximation for the hypsometric integral. *J. Geol.* 1959. 67
Wooldridge, S. W. The trend of geomorphology. *Trans. I.B.G.* 1958. 25

Biogeography

This branch of the subject is rapidly growing in importance and is likely to receive increasing attention by research workers. Several valuable papers dealing with soil studies and vegetation have been produced, while work on the relationship between micro-climate, soils and ecology on the Mendip Hills (F. G. Hannell and L. F. Curtis) is now in progress.

Papers

Bower, M. M. Peat erosion in the Pennines. *Adv. Sci.* 1960. 16
Cole, M. M. Vegetation studies in South Africa. *Geog.* 1956. 41
Cole, M. M. Cerrado, Caatinga and Pantanal: distribution and origin of the savanna vegetation of Brazil. *G.J.* 1960. 126
Johns, E. The surveying and mapping of vegetation on some Dartmoor pastures. *Geog. Stud.* 1957. 4
Proudfoot, V. B. and Boal, F. W. Two soil maps of County Down. *G.J.* 1960. 126
Taylor, J. A. Methods of soil study. *Geog.* 1960. 45

Medical geography

The study of medical geography, fraught with many difficulties, is now making some headway and several significant papers have been produced in the past few years, of which one dealt with the distribution of cancer mortality in Wales, 1947–53 (G. Melvyn Howe).

Papers

Banks, L. A. Trends in the geographical pattern of disease. *Geog.* 1956. 41
Gilbert, E. W. Pioneer maps of health and disease in England. *G.J.* 1958. 124

Learmonth, A. T. A. Some contrasts in the regional geography of malaria in India and Pakistan. *Trans. I.B.G.* 1957. 23

Water supply

Recurrent shortages of water in certain parts of the country, accentuated by the exceptionally dry summer of 1959, have caused several geographers to devote attention to this problem, notably the aspects of rainfall and run-off. Prof. W. G. V. Balchin and S. Gregory have been prominent in this work.

Papers

Balchin, W. G. V. Water resources of Great Britain. *Nature* 1956. 177
Balchin, W. G. V. A water use survey. *G.J.* 1958. 124
Gregory, S. Rainfall and water supply problems in the British Isles. *Adv. Sc.* 1957. 13

II. Human Geography

Social geography

A large number of contributions to population geography, urban geography and rural settlement have been made, including several projects involving group investigation which are still in progress, such as the study of urban spheres of influence being carried out in Scotland and the work being done on English towns under the general direction of Prof. A. E. Smailes. Under the heading of rural settlement, the crofting survey undertaken by the department at Glasgow, assisted by the Geographical Field Group, should also be noted. Not unnaturally many studies in urban geography are related to planning or their application thereto.

Population Geography

Papers

Clarke, J. I. Rural and urban sex-ratios in England and Wales. *Tijds. Econ. Soc. Geog.* 1960. 51
Cole, J. P. Urban population changes in the U.S.S.R. 1939–1956. *Tijds. Econ. Soc. Geog.* 1957. 48
Dickinson, R. E. The geography of commuting in the Netherlands and Belgium. *Geog. Rev.* 1957. 47
Green, F. H. W. Community of Interest Areas. *Econ. Geog.* 1958. 34
Hunt, A. J. and Moisley, H. A. Population mapping in urban areas. *Geog.* 1960. 45
Johnson, B. L. C. The distribution of factory population in the West Midland conurbation. *Trans. I.B.G.* 1958. 25
Lawton, R. The daily journey to work in England and Wales. *Town Planning Rev.* 1958–9. 29
Osborne, R. H. The movements of people in Scotland 1851–1951. *Scottish Studies* 1958. 2

Urban Geography, including Planning

Books

Freeman, T. W. Geography and Planning, 1958
Freeman, T. W. The Conurbations of Great Britain, 1959
Stamp, L. D. Applied Geography, 1960

Papers

Britain

Bennett, W. J. and Cole, J. P. Three English Naval Dockyard towns. *Tijds. Econ. Soc. Geog.* 1958. 49
Carter, H. Urban hierarchy and historical geography: a consideration with reference to North-east Wales. *Geog. Stud.* 1956. 3
Edwards, K. C. Location factors in the development of Nottingham. *E. Midland G.* 1956. 5
Jones, E. Delimitation of some urban landscape features in Belfast. *Scottish G. Mag.* 1958. 74
Leeming, F. A. An experimental survey of retail shopping and service facilities in part of North Leeds. *Trans. I.B.G.* 1959. 26
Pocock, D. C. D. The growth of British New Towns. *Tijds. Econ. Soc. Geog.* 1960. 51

Stedman, M. B. The townscape of Birmingham in 1956. *Trans. I.B.G.* 1958. 25
Powell, A. G. The recent development of Greater London. *Adv. Sc.* 1960

Foreign

Cole, M. M. The Witwatersrand conurbation. *Trans. I.B.G.* 1957. 23
Harrison-Church, R. J. West African urbanization. *Sociol. Rev.* 1959
Morgan, W. B. The "Grassland Towns" of the Eastern region of Nigeria. *Trans. I.B.G.* 1957. 23

General

Best, R. H. The urban area of Great Britain. *Town Planning Rev.* 1958. 28
Lambert, A. M. Millionaire cities. *Econ. Geog.* 1956. 32
Linton, D. L. Millionaire cities today and yesterday. *Geog.* 1958. 43
Odell, P. R. The hinterlands of Melton Mowbray and Coalville. *Trans. I.B.G.* 1957. 23

Rural Settlement

Papers

Buchanan, R. H. Rural changes in an Irish townland 1890–1955. *Adv. Sc.* 1958. 14
Evans, E. E. Rural settlement in Ireland and West Britain. *Adv. Sc.* 1959. 15
Johnson, J. H. Studies in Irish rural settlement. *Geog. Rev.* 1958. 48
MacSween, R. S. Transhumance in North Skye. *Scottish G. Mag.* 1959. 75
Mead, W. R. The margin of transference in Finland's rural settlement. *Tijds. Econ. Soc. Geog.* 1957. 48

Economic geography

Many studies have been made dealing with agriculture and land use, the geography of industries, geographical aspects of industrial location and the geography of transport. British geographers have contributed regional studies in connection with the World Land Use Survey, such as the monographs on Hong Kong (T. R. Tregear), Cyprus (D. Christodoulou) and the paper on land use in the Transvaal Low Veld (M. M. Cole), all edited by Prof. L. D. Stamp, whose Presidential Address to the 18th Geographical Congress on "The Measurement of Land Resources" appeared in the *Geographical Review*, vol. 48, 1958. Prof. M. J. Wise and others have been concerned with the problems of economic development in large cities, especially Greater London, and with the concept of the city region in relation to planning.

Agricultural and Land Use

Book

Stamp, L. D., Our developing world, 1960.

Papers

Land Use—crops

Coppock, J. T. The changing arable in the Chilterns, 1875–1951. *Geog.* 1957. 42
Johnson, B. L. C. Crop-association regions in East Pakistan. *Geog.* 1958. 43
Large, D. C. Cotton in the San Joaquin valley: a study of Government in agriculture. *Geog. Rev.* 1957. 47
Pocock, D. C. D. England's diminished hop-acreage. *Geog.* 1959. 44

Land Use—animals

Barnes, F. A. The evolution of the salient patterns of milk production and distribution in England and Wales. *Trans. I.B.G.* 1958. 25
Chew, H. C. Changes in land use and stock over England and Wales, 1939–1951. *G.J.* 1956. 122
Simpson, E. S. The cattle population of England and Wales; its breed structure and distribution. *Geog. Stud.* 1958. 5

Soil and land use

Bunting, B. T. Vallundgaard: a study of land use in a podsolized area of West Jutland. *Trans. I.B.G.* 1959. 26
Stevens, A. J. Surfaces, soils and land use in North-east Hampshire. *Trans. I.B.G.* 1959. 26
Barbour, K. M. Irrigation in the Sudan: its growth, distribution and potential extension. *Trans. I.B.G.* 1959. 26

General

Bull, G. B. G. Thomas Milne's land utilization map of the London area in 1800. *G.J.* 1956. 122
Coppock, J. T. The statistical assessment of British agriculture. *Agric. Hist. Rev.* 1956. 4
Duckham, A. N. The current agricultural revolution. *Geog.* 1959. 44
House, J. W. Afforestation in Britain. The case of the Anglo-Scottish Borderlands. *Tijds. Econ. Soc. Geog.* 1956. 47
Joatmien, S. and Mead, W. R. The intensification of Finnish farming. *Econ. Geog.* 1957. 33

Industrial geography

Books

Chisholm. Handbook of Commercial Geography. 15th Edition by Stamp, L. D. and Gilmour, S. C., 1956; 16th Edition, 1960.
Shorter, A. H. Paper mills and paper makers in England 1495–1800, 1957
Pounds, N. G. and Parker, W. N. Coal and steel in Western Europe, 1957
Pounds, N. G. The geography of iron and steel, 1959

Papers

Regional studies

Birch, J. W. The economic geography of the Isle of Man. *G.J.* 1958. 124
Dickinson, R. E. The Braunschweig industrial area. *Econ. Geog.* 1958. 34
Estall, R. C. and Martin, J. E. Industry in Greater London. *Town Planning Rev.* 1957–8. 28
Hooson, D. J. M. The recent growth of population and industry in Hertfordshire. *Trans. I.B.G.* 1958. 25
Wise, M. J. The role of London in the industrial geography of Great Britain. *Geog.* 1956. 41

Specific industries

Kirk, W. The cotton and jute industries of India. *Scottish G. Mag.* 1956. 72
Thomas, T. M. Wales, land of mines and quarries. *Geog. Rev.* 1956. 46
Turner, W. H. K. The textile industry of Perth and district. *Trans. I.B.G.* 1957. 23

Industrial location

Martin, J. E. Location factors in the Lorraine iron and steel industry. *Trans. I.B.G.* 1957. 23
Rawstron, E. M. Three principles of industrial location. *Trans. I.B.G.* 1958. 25
Robertson, C. J. Locational and structural aspects of industry in Edinburgh. *Scottish G. Mag.* 1958. 74

Power industry

Edwards, K. C. East Midlands coal production in relation to Britain's fuel and power problem. *E. Midland G.* 1956. 6
Estall, R. C. The problem of power in the United Kingdom. *Econ. Geog.* 1958. 34
Manners, G. Recent changes in the British gas industry. *Trans. I.B.G.* 1959. 26
Thomas, T. M. Recent trends and developments in the British coal mining industry. *Econ. Geog.* 1958. 34

General

Wise, M. J. Some economic trends influencing planning policies. *J. Town Planning Inst.* 1960. 46
Wallwork, K. L. Some problems of subsidence and land use in the Mid-Cheshire industrial area. *G.J.* 1960. 126

Transport geography

Books

O'Dell, A. C. Railways and geography, 1956
Bird, J. The geography of the Port of London, 1957
Sealy, K. R. The geography of air transport, 1957

Papers

Appleton, J. The railway geography of South Yorkshire. *Trans. I.B.G.* 1956. 22
Mountjoy, A. B. The Suez Canal in mid-century. *Econ. Geog.* 1958. 34
Nathan, Lord. World aviation and geography. *Geog.* 1957. 42

Political geography

A comparatively small but nevertheless increasing amount of work has been done in this field. At the London School of Economics research has been carried out on the problems of political geography and the administration of the capital, as a result of which evidence has been submitted to the Royal Commission on Greater London.

Books

East, W. G. and Moodie, A. E., *ed.* The changing world, 1956
Cole, J. P. Geography of world affairs, 1959

Papers

Brookfield, H. C. Some geographical implications of the Apartheid and partnership policies in South Africa. *Trans. I.B.G.* 1957. 23
House, J. W. The Franco-Italian Boundary in the Alpes Maritimes. *Trans. I.B.G.* 1959. 26
Kirk, W. The Sino-Indian frontier dispute: a geographical review. *Scottish G. Mag.* 1960. 76
Smith, C. G. Arab Nationalism: a study in political geography. *Geog.* 1958. 43

III. Historical Geography

A considerable quantity of work, varying greatly in scope, has yielded many contributions, of which the most characteristic are the historical studies of agriculture and land use in Britain. Attention has also been devoted to problems of rural settlement. Prof. H. C. Darby's recent paper "An Historical Geography of England: twenty years after," *Geogr. J.*, vol. 126, June 1960, contains an admirable review of progress and a discussion of source material. Research on lynchets in southern England (University of Reading) and elsewhere has aroused new interest in an old problem. Prof. A. Davies, continuing his work on geographical discovery, has completed further research on Columbus and the Portuguese navigators.

Books

Harvey, P. D. and Thorpe, H. The printed maps of Warwickshire 1576–1900, 1959
Kirwan, L. P. The white road; a survey of polar exploration, 1959
Taylor, E. G. R. The haven-finding art, 1956
Taverner, L. E. The Common Lands of Hampshire, 1957
Skelton, R. A. Explorers' maps; chapters in the cartographic record of geographical discovery, 1958
Sylvester, D and Nulty, G. The Historical Atlas of Cheshire, 1958

Papers

Agricultural and land use

Davies, E. Treens and Quarterlands in the Isle of Man. *Trans. I.B.G.* 1956. 22
Davies, M. Rhosili open field and related South Wales field pattern. *Agric. Hist. Rev.* 1956. 6
Donkin, R. A. Cistercian sheep-farming and wool sales in the thirteenth century. *Agric. Hist. Rev.* 1958. 6
Emery, F. V. Contribution to an Agrarian History of England. Vol. IV, 1500–1640, Agrarian regions of Wales
Eyre, S. E. The upward limit of enclosure on the East Moor of North Derbyshire. *Trans. I.B.G.* 1957. 23
Harris, A. The open fields of East Yorkshire. *Local History Series* 1959. 9
Harris, A. Agriculture of the East Riding of Yorkshire before the parliamentary enclosures. *Yorks. Arch. Journ.* 1959. 40
Kirk, W. The primary agricultural colonization of Scotland. *Scottish G. Mag.* 1957. 73
Maxwell, I. S. The former distribution of vegetation in Roseland as deduced from place names. *Trans. I.B.G.* 1958. 25
Prince, H. C. The tithe surveys of the mid-nineteenth century. *Agric. Hist. Rev.* 1959. 7
Sylvester, D. The common fields of the coastlands of Gwent. *Agric. Hist. Rev.* 1958. 6
Thomas, D. The acreage returns of 1801 for the Welsh Borderland. *Trans. I.B.G.* 1959. 26
Thorpe, H. A special case of heath reclamation in the Alheden district of Jutland 1700–1955. *Trans. I.B.G.* 1957. 23

Vollans, E. C. The evolution of farmlands in the central Chilterns in the twelfth and thirteenth centuries. *Trans. I.B.G.* 1959. 26

Settlement

Fuller, G. J. The development of drainage, agriculture and settlement in the Fens of South-east Lincolnshire during the nineteenth century. *E. Midland G.* 1957. 7

Harris, A. The lost villages and the landscape of the Yorkshire Wolds. *Agric. Hist. Rev.* 1958. 6

Mills, D. R. The Poor Laws and the distribution of population from 1600 to 1860 with special reference to Lincolnshire. *Trans. I.B.G.* 1959. 26

Watson, E. Geographical factors in the Neolithic colonization of North-east Ireland. *Trans. I.B.G.* 1956. 22

General

Davies, A. The first discovery and exploration of the Amazon. *Trans. I.B.G.* 1956. 22

Emery, F. V. English regional studies from Aubrey to Defoe. *G.J.* 1958. 124

Kirwan, L. P. Rome beyond the southern Egyptian frontier. *G.J.* 1957. 123

Morgan, W. B. The influence of European contacts on the landscape of South Nigeria. *G.J.* 1959. 125

Sheppard, J. A. The medieval meres of Holderness. *Trans. I.B.G.* 1957. 23

Cartographic

Allen, W. E. D. The sources for G. Delisle's "Carte des pays voisins de la Mer Caspienne" of 1723. *Imago Mundi.* 1956. 13

Bull, G. B. G. Elizabethan maps of the Lower Lea valley. *G.J.* 1958. 124

Taylor, E. G. R. A letter dated 1577 from Mercator to John Dee. *Imago Mundi.* 1956. 13

Yates, E. M. History in a Map. *G.J.* 1960. 126

IV. Cartography and Surveying

Geographers have contributed to the preparation of a number of atlases such as the 'Oxford Atlas of Britain' to be published in the autumn of 1961. The 'Oxford Economic Atlas of the World' was published in 1957. With the appearance of Volume II (South-West Asia and Russia) in 1960, '*The Times* Atlas of the World' in five volumes was completed. A national atlas of Wales is in preparation at Aberystwyth. The Ordnance Survey has produced many new maps, including the first sheets of the non-provisional editions of the Six-Inch and 1:25,000 series and sheets of two attractive small scale series, the Half-Inch and Quarter-Inch. Several sheets of the excellent new One-Inch Tourist maps have also been published.

Books

Birch, T. W. Map and photo reading, 1956

Debenham, F. The world is round, 1960

The Geographical Magazine: Special atlases and mapmaking number. April, 1960

V. Regional Geography

In addition to many regional studies appearing in the form of papers, a number of textbooks and other books following a regional treatment have been published in the four-year period and it would seem appropriate here to list some of the latter.

Books

British Isles

Bowen, E. G. (edited). Wales, a physical, historical and regional geography. 1957

Daysh, G. H. J. (edited). A survey of Whitby and the surrounding area. 1958

Freeman, T. W. Pre-Famine Ireland. 1957

Fawcett, C. B. Provinces of England. Revised edition by W. G. East and S. W. Wooldridge. 1960

Geddes, A. Lewis. 1956

House, J. W. and Fullerton, B. Tees-side in mid-century. 1960
House, J. W. Northumbrian Tweedside. 1956
Howe, G. M. Wales from the air. 1957
O'Dell, A. C. and Walton, K. Highlands and Islands of Scotland (in proof).
Shorter, A. H. and Ravenhill, W. South-west England (in preparation).
Smailes, A. E. North England. 1960
Watson, J. W. and Miller, R. (edited). Geographical Essays in memory of A. G. Ogilvie. 1959
Wise, M. J. The West Midlands; a pictorial survey. 1958
Wooldridge, S. W. and Hutchings, G. E. London's countryside. 1957

Europe

Fisher, W. B. and Bowen-Jones, H. Spain: a geographical background. 1958
Mead, W. R. An economic geography of the Scandinavian countries and Finland. 1959
Monkhouse, F. J. A regional geography of Western Europe. 1959
O'Dell, A. C. The Scandinavian world
Ogilvie, A. G. Europe and its Borderlands. 1957
Walker, D. S. A geography of Italy. 1958

Africa

Grove, A. T. Land and population in Katsina Province. 1957
Grove, A. T. The Benue Valley, Northern Nigeria. 1957
Harrison-Church, R. J. West Africa. 1957

Asia

Farmer, B. H. Pioneer peasant colonization in Ceylon, 1957
Fisher, C. A. A social, economic and political geography of South-east Asia (in press).
Learmonth, A. T. A. Medical geography in Indo-Pakistan: a study of 20 years data. 1958
Stamp, L. D., India, Pakistan, Ceylon and Burma. 1957 (reprinted from Asia, 9th Edition)

Tropical lands

Steel, R. W. and Fisher, C. A. Geographical essays on British tropical lands. 1956

Papers

Europe

Thomas, J. G. The geographical distribution of the Welsh language. *G.J.* 1956. 122
Mead, W. R. The seasonal round: a study of adjustment on Finland's pioneer fringe. *Tijds. Econ. Soc. Geog.* 1958. 49
North, G. Poland's population and changing economy. *G.J.* 1958. 124

Africa

Baker, S. J. K. Buganda: a geographical appraisal. *Trans. I.B.G.* 1956. 22
Steel, R. W. The Copperbelt of Northern Rhodesia. *Geogr.* 1957. 42.

Asia

Cole, J. P. A new industrial area in Asiatic U.S.S.R. *G.J.* 1956. 122

VI. Methodology

Articles on various aspects of the teaching of Geography appear from time to time in educational journals. The more important of these however are published in the Geographical Association's quarterly *Geography* or as special publications of the Association such as 'Teaching Geography in Junior Schools,' 1959. A useful general work 'The Teaching of Geography' by G. H. Gopsill appeared in 1956. A British delegation attended the third International Conference of Teachers of Geography held at Grenoble in 1956. In connection with the I.G.U. Commission on The Teaching of Geography, an investigation into the ability of children to read maps was carried out by a sub-committee under the chairmanship of Mr. T. W. Brown. The work involved the testing of pupils of different age-groups in various types of school and a report on the results has been prepared for the Congress at Stockholm.

Societies and Institutions

Royal Geographical Society

During the four-year period, the Society has continued to encourage, advise and assist numerous expeditions to many parts of the world, including a number organized by University exploration clubs. An interesting feature has been the increase in research by British geographers in South America, to assist which a small Latin American travel fund has been established. But the main expedition with which the Society has been associated was of course the Commonwealth Trans-Antarctic Expedition, which culminated in the first crossing "on the ground" of the Antarctic Continent by a party under Dr. Vivian Fuchs, the Expedition's leader, whose work was recognized by the conferment of a knighthood. Papers on the Expedition and various aspects of its scientific work, coordinated with the International Geophysical Year, have been published in the *Geographical Journal*, which has also contained accounts of several other expeditions supported by the R.G.S. The Society is now recognized as the national body to which the plans of expeditions of all types should be submitted for approval. Though the Society is in some cases able only to make small financial grants, the total grants to expeditions during this period exceeded £3,800, exclusive of a grant of £3000 to the Commonwealth Trans-Antarctic Expedition. Many considerable grants for exploration and research in mountainous regions were also made by the Mount Everest Foundation, constituted by the R.G.S. and the Alpine Club.

The Society, with the help of the Marc Fitch Fund, has established a fellowship for research on the topography and geography of the Roman Fenland, and work will shortly begin. A Committee on Medical Geography has also been constituted by geographers and medical scientists to initiate research of common interest.

The Research Committee, now separate from the Expeditions Committee, has on it representatives of the Institute of British Geographers, the Geographical Association, and University Departments of Geography.

The Geographical Journal, containing papers on all aspects of geography, has been published quarterly and its circulation increases steadily. Two memoirs in the Research Series have also been published: No. 3. 'The Making of the Broads: a re-examination of the problem in the light of new evidence,' by J. M. Lambert, J. N. Jennings, C. T. Smith, Charles Green and J. N. Hutchinson; and No. 4. 'Investigations on Norwegian cirque glaciers,' edited by W. Vaughan Lewis. In cooperation with the Bodleian Library, it has also published a facsimile in colour of 'The Gough Map of Great Britain, *circa* A.D. 1360,' with a memoir by E. J. S. Parsons. Another publication in this series, 'Manuscript and printed maps of Great Britain, A.D. 1250–1579,' is in active preparation. 'A new map of Southern Arabia,' 1:500,000 in two sheets from the surveys of H. von Wissman and other travellers, was published in 1958. The Drawing Office of the Society has completed the compilation and drawing of a map of the Mount Everest Region, on the scale of 1:100,000, to be published in 1960.

Considerable work has been done in the Library on the 'Glossary of geographical terms,' prepared by a sub-committee of the British Association and edited by Professor L. Dudley Stamp.

Good progress has been made in arranging and indexing the archives of the Society, which throw much light on the history of exploration and of geography in the nineteenth and twentieth centuries. The scope and present organization of the Society's Map Collection are explained in a paper by G. R. Crone and E. E. T. Day in *The Geographical Journal*, March 1960.

The Permanent Committee on Geographical Names has published "Lists of Names (New Series) No. 3: Czechoslovakia" and "No. 4: Bulgaria," and a "Glossary of Arabic geographical terms" is in an advanced stage of preparation.

Royal Scottish Geographical Society

The Royal Scottish Geographical Society, with a steadily increasing membership, now at above 3,390, continued to promote interest in the subject through the publication of the *Scottish Geographical Magazine*, lectures and film shows, and the organization of study tours abroad. A committee for River Flow Studies has been set up under the chairmanship of Dr. R. Maclagan Gorrie to investigate Scottish river conditions, with special reference to flooding. In 1959, to mark the seventy-fifth anniversary of the Society's foundation in 1884, an exhibition entitled "Mapping Britain," illustrating present-day methods of survey and map-making was held in the Royal Scottish Museum at Edinburgh.

The British Association

At the annual meetings of the British Association for the Advancement of Science, the programmes arranged for Section E (Geography) have been strongly supported. The meetings provide a valuable opportunity for the reading of papers, for joint discussion between two or more Sections on topics of mutual interest and for field excursions under specialist guidance. Also of great value from the geographical point of view is the publication each year of a regional handbook dealing with the city and district in which the meeting is held, while a traditional feature of the Section E programme is an introductory lecture on the local area given by a leading geographer.

The meetings held in the past four years, together with the names of the Section's Presidents and the titles of their presidential addresses, were as follows: Sheffield 1956, Prof. A. A. Miller "The use and misuse of climatic resources"; Dublin 1957, Prof. D. L. Linton "The everlasting hills"; Glasgow 1958, Prof. E. E. Evans "The Atlantic ends of Europe"; York 1959, Prof. K. C. Edwards "Trends in urban expansion". The presidential addresses and a selection of other papers are published in the Association's journal, *The Advancement of Science*, now a bi-monthly. Particular significance was attached to last year's meeting at York both for British science in general and for geography in particular, for on the one hand it marked the centenary of the publication of Charles Darwin's 'The Origin of Species' and on the other the centenary of the deaths of Alexander von Humboldt and Karl Ritter. In connection with the latter, Prof. Karl Troll, Bonn, who was a guest of Section E, delivered a stimulating address on the two founders of modern geography.

The Institute of British Geographers

Essentially a body of academic geographers, the Institute continues to grow in strength and importance and now has a membership of over 600. The Institute's annual conference held at one or other of the universities early in the New Year, and now established as a major event in the calendar of British geographers, is certainly the most important occasion for the presentation of papers and for the discussion of research problems. It also provides an opportunity for informal exchange of views on general matters. More than 200 members attend the conference, the largest number so far recorded being 270 at Cambridge in 1959. A sign of the increasing

vigour of the Institute is the development of small discussion groups at the conference. From certain of these groups useful proposals for coordinating research undertaken by individual workers are now being advanced.

Details of the conferences held in the past four years are as follows: Leeds 1957, President Prof. L. D. Stamp, "Geographical Agenda: a review of some tasks awaiting geographical attention"; Nottingham 1958, President Prof. R. H. Kinvig, "The Isle of Man and Atlantic Britain"; Cambridge 1959, President Prof. E. G. Bowen, "Le Pays de Galles"; Southampton 1960, President Prof. W. G. East, Acting-President, Prof. K. C. Edwards.

At the invitation of the Geographical Institute of the Polish Academy of Sciences, a delegation of members of the Institute took part in a seminar with Polish geographers in Warsaw under the auspices of UNESCO in September 1959. The delegation consisted of twelve members under the leadership of Prof. K. C. Edwards and the seminar was conducted under the title of "The application of geographical research," a report of which appeared in *The Geographical Journal*, March 1960, pp. 115–17.

The Institute's *Transactions* are published annually, and the volumes for 1956-9 (inclusive) contained in all fifty-two research papers, besides the presidential addresses. An additional publication in the form of a monograph by Dr. G. J. Butland, entitled 'The Human Geography of Southern Chile,' appeared in 1957.

The Geographical Association

The Geographical Association, which is mainly concerned with geography in schools, has its headquarters at Sheffield and publishes the quarterly journal *Geography*. The Association now has a membership of about 5000, distributed over some fifty branches which promote an active interest in the subject by lectures, discussions and excursions. The Central Office of the International Union of Associations of Geography Teachers is at the Association's headquarters. In various ways the Association maintains close contact with the Education Authorities, the Institutes of Education and the universities. The Association maintains several standing committees concerned with Primary Schools, Secondary Schools, Public and Preparatory Schools, Further Education, Training Colleges, Visual Aids and Field Studies respectively. Through its activities, including many special publications, the Association does much to stimulate a progressive attitude towards geography and to encourage the efficient teaching of the subject throughout the country. Among recent publications are "The Place of Geography in the Education of Boys and Girls of 15 to 18," 1957, originating as a memorandum submitted to the Central Advisory Council of the Ministry of Education, "Geography Departments in Training Colleges," 1959, and "Teaching Geography in Junior Schools," 1959. A series of illustrated booklets entitled 'British Landscapes through Maps,' edited by Prof. K. C. Edwards, is now in course of publication, two of which have already appeared: 'The English Lake District,' by F. J. Monkhouse, 1960, and 'The Yorkshire Dales' by C. A. M. King, 1960.

The Association holds an annual conference in London in January and a spring conference at a different centre each year. The presidents over the past four years and the titles of their presidential addresses were: in 1956 Lord Nathan, "World Aviation and Geography"; in 1957 Prof. P. W. Bryan, "Geography and Landscape"; in 1958 Prof. R. O. Buchanan, "Some reflections on Agricultural Geography"; and in 1959 Prof. J. A. Steers, "Physiography: some reflections and trends."

Other Organizations and Publications

The Geographical Field Group (President, Prof. K. C. Edwards) now has the Department of Geography, University of Nottingham, as its official address. Field studies organized by the Group have been further developed in the past four years and the following reports on work undertaken at various centres have been published: "The Bernese Jura," ed. G. J. Fuller, 1957; "Elba," ed. G. J. Fuller, 1958; "The Alleghe area, Italian Dolomites," ed. F. A. Barnes, 1959; "Park, a geographical study of a Lewis crofting district," ed. J. B. Caird, 1959.

The need for further outlets for the growing volume of geographical research has been partly met by the publication of research bulletins and occasional monographs from individual university departments. A consistent output of such work has been a feature of King's College, Newcastle, University of Durham, for some years and more recently from Durham itself. Meanwhile *Geographical Studies*, which first appeared in 1954, sponsored by a representative group of younger university geographers, continues to be published, four numbers containing seventeen papers in all having been issued since 1956. The *East Midland Geographer*, produced twice yearly by the University of Nottingham, is the only regional journal and its circulation has increased substantially during the past four years.

Among new publications is *Geomorphological Abstracts*, edited by Dr. K. M. Clayton, the purpose of which is to direct attention to the large output and wide range of geomorphological research by presenting abstracts of published work. The first issue, appearing in June 1960, contains fifty-seven abstracts though some of them are inevitably very brief. Of considerable interest to geographers is *Field Studies*, a new periodical to appear annually, launched by the Field Studies Council (formerly the Council for the Promotion of Field Studies) containing articles belonging to various branches of natural science, some of them relating to the districts in which the Council's half-dozen centres are situated. The first number, appearing in May 1959, contained eight papers of which four were essentially geographical.

Acknowledgments.—The writers of this Report wish to express their thanks to all those who contributed information; to Dr. C. A. M. King of the University of Nottingham for her help in assembling the lists of publications; and to the Royal Geographical Society for having the Report printed. The writers alone are responsible for any serious omissions. Additional copies of this Report may be obtained on application to the Director and Secretary of the Royal Geographical Society.

SOME GEOGRAPHICAL ASPECTS OF QAṬAR

T. M. JOHNSTONE AND J. C. WILKINSON

THE PENINSULA of Qaṭar (locally Gaṭar) covers an area of some 4000 square miles and protrudes into the Persian Gulf like an appendix to the Arabian Jazīra. Although it is such a marked cartographical feature, it is remarkable how little information existed about it prior to the exploration for oil there. In fact, it is not until well into the nineteenth century that the outline of Qaṭar becomes recognizable on European maps.

Earlier maps usually showed two large islands, with a varying number of smaller ones, corresponding to Bahrain, and only a slight bulge in the mainland opposite. A river on which was sited the "village" of al-Ḥasā (or rather variants of the name) ran into the sea in the vicinity of where the Bay of Salwā should be.[1] Since navigators only knew the north end of the peninsula, it is quite probable that this part was considered an island of the Bahrain group. Information might also have been confused because the term "Bahrain" was used for part of the mainland as well as the islands themselves. However, certain Qaṭar names are recognizable on maps of the late eighteenth and early nineteenth centuries. On the D'Anville/Niebuhr map of 1794, there is a "Deh Rogn" (Persian *deh* meaning *village*) marked on one of the islands. This may be "Rakan" (the northern tip of the Qaṭar peninsula and a prominent landmark to seamen). The Niebuhr map of 1765 (reproduced opp. p. 110 in S. M. Zwemer, 'Arabia, the cradle of Islam,' 1900) does not show Deh Rogn, though it shows Huäli and Faräha (al-Ḥuwēla and al-Farēḥa). On the mainland is "Khau," which might possibly be Khor Ḥassān, as well as a prominent estuary into which the above-mentioned river flows; perhaps the Bay of Salwā (or Salwa). On the other hand, there is no mention of Qaṭar, although Niebuhr on the map of the Gulf published in his 'Voyage en Arabie'[2] marks the land east of this estuary: "Gattar." However, he shows no river in this map.

The detail of this whole area is shown well on a map on the scale of 1:1641836 in an atlas published by Ph. Vandermaelen in 1827. Four places are marked in a group on the mainland, two of which are definitely recognizable as on the northern tip of Qaṭar–Core Hessan (Khor Ḥassān, today known as al-Khuwēr) and Jumale (al-Jumēl). The first trace of a proper peninsula we can find is on Arrowsmith's map of 1825. He shows a small peninsula on which is marked "Ras Reccan" on the west coast and in the bay thus formed are two small islands marked Bahrain. Unfortunately, the whole area is so minute in relation to the rest of the Gulf that the map is little improvement on earlier attempts. One other feature is worthy of note: in Niebuhr's own map and in Pinkerton's atlas of 1815, the western end of the outline of the pearl banks looks suspiciously like a rough outline of Qaṭar. It may be that descriptions of the pearl banks available to travellers were more accurate than that of the land itself, and since these banks lie in shallow water off the land, the result is a rough outline of the peninsula.

It was only in 1822, after more peaceful conditions had been established along the Trucial Coast, that a survey of this area was undertaken by the Indian Navy, and by April 1825 the two survey vessels *Discovery* and *Psyche* had completed their survey of the whole western coast of the Persian Gulf.[3] However, it was not until recent years that the complete outline of Qaṭar was accurately mapped, for even in 1923 the

west coast of Qaṭar as far as Dukhān is shown dotted on the map accompanying the first of Cheesman's articles.[4]

Post-classical references to Qaṭar are few, both in Arabic and European sources, and rarely extend to more than the name itself. The earliest Arab geographers to mention it are b. Khurradādhbeh (d. A.D. 849) who mentions it as one of the stops on route from Baṣra to 'Uman,[5] and al-Hamdānī (d. A.D. 945) who mentions it amongst

Fig. 1. The Qatar peninsula

a list of places in a general description of the Arabian Peninsula and later as a point on a route.[6] Qaṭar is not mentioned by the other Arab geographers of the ninth and tenth centuries, as far as we can ascertain. Even as late as Yāqūt (A.D. 1179–1229)[7] and b. Manẓūr (A.D. 1232–1311)[8] Qaṭar is only briefly noted as a village or town. Amongst the first Europeans to mention it is Teixeira at the end of the sixteenth century who, describing the pearl fishing of Bahrain, says: "The fishery of Barhen begins in some years in June, but more usually in July and goes on during that month and August. A fleet is formed of about two hundred 'terradas,' more or less—a

hundred from Barhen, fifty from Julfar, fifty from Nihhelu. They commonly go to fish at Katar, a port of Arabia, ten leagues south of the Isle of Barhen." [9]

With the settlement of the Āl Khalīfa from Kuwait in al-Zubāra, in the north-east of the peninsula, historical and geographical information is more abundant.[10] The north-west coast and the east coast down to somewhere in the vicinity of the present oil terminal of Umm Said (Msē'īd), and the pearl banks off its shores, were well known to Arab navigators, and with the attack of the Persians on Basra in 1776 many merchants from that port took refuge in al-Zubāra, and for a short while it enjoyed a great prosperity. A few years after this, Khor Ḥassān, a little to the north of al-Zubāra, became the base of the famous pirate Raḥma b. Jābir.

As far as we can discover, the first European[11] to visit Qaṭar was a Lieutenant Grubb[12] of the Indian Navy who landed at Bida' in 1822. He described it in not very flattering terms as "a most miserable place, not a blade of grass nor any kind of vegetation near it; the water good, procured they said at some distance." But for the first full description of Bida' we must rely on Palgrave.[13] The first European to travel in the interior of the peninsula was Hermann Burchardt, who traversed Qaṭar from Salwā to al-Doḥa via Mukēnis in January 1904.[14] A few years later a remarkably accurate description of the geography of the peninsula and its tribes appears in Lorimer's monumental but rare work 'Gazetteer of the Persian Gulf.'[15]

The Qaṭar of today is a country of oil with its rapidly expanding capital of al-Doḥa and its two oil towns: Dukhān, whose oilfields produces some eight million tons of oil a year, and the oil terminal at Umm Said. The population has almost trebled since the discovery of oil in 1940, to between 35,000 and 40,000 (of which over 25,000 live in al-Doḥa) because of a large influx of non-Qaṭaris. Before the geographical and tribal pattern of the days of pearling, fishing and herding completely disappears and local dialect undergoes changes due to outside influences and urbanization, it may be of some value to record the tribal distribution and to make a study of topographical terms used in the peninsula of Qaṭar. The object of this study is not necessarily to collect new terms, though a number of them seem to be local, but to define a group of topographical terms as used in one country,[16] and to comment on similar and variant usages only where the comparison is of interest.

The Tribes

The tribes[17] of Qaṭar appear to have originated from two sources: from the Arabian Peninsula via al-Ḥasā province, or by settlement along the coast from different parts of the Gulf. On the whole, the former are the badū whose *dīras*[18] cover enormous areas in and along the borders of the Rub' al-Khālī and whose distribution and numbers in Qaṭar are determined by the season's rainfall and the consequent state of their grazing grounds. Chief among these tribes are the 'Awāmir (sing. 'Āmirī), the Manaṣīr (sing. Manṣūrī) and the Banī Hājir (or Hāīir, sing. Hājirī). These tribes are rarely found north of Kar 'āna, though in exceptional seasons they are said to range as far north as al-Zubāra. However, there is a band of the Banī Hājir entirely within Qaṭar living a semi-nomadic life in the south-west and centre of the peninsula.

Amongst the settled tribes it is hard to determine which are badū tribes that have settled, and which come from overseas. Two factors have influenced the pattern of settlement: water supply, and suitable sites to act as ports for pearling and fishing. With the decline in this way of life, many former sites have been abandoned, and with the migration to Doḥa and to work in the oil towns, many villages are but shadows of their former selves. The concentration of village settlement is in the north, where rainfall is highest, along the coast. The terms for these tribes is Hal (Ahl) al-Shemāl.[19] Rainfall figures for the north have not been recorded, but

figures from Dukhān kept over a ten-year period show that the seasonal rainfall never reached 5 inches. Rainfall, however, is definitely heavier in the north, and occasional measurements that have been taken recently bear this out. Water lies in certain places, in the type of depression known as *wa'ab*, for long periods in the winter.

The Hal al-Shemāl tribes are distributed as follows: on the east coast in and around Khor and the Al-Mahānda (properly Mahānida, sing. Mahandi). This tribe is almost certainly a settled section of the Banī Hājir and has some ten sub-sections. The most important of these are the Āl Misnid and the Āl Ḥasan who live a little north of Khor at al-Dhakhīra. A very small sub-section, the Āl Faḍāla, live in the extreme north-east of the peninsula at Al Mafjar. North of the Al-Mahānda, in a group of villages in the area of Ghashamiyya, are the Āl Bū Kawāra[20] (sing. Kawārī). Along the north coast are found the Sāda (sing. Sayyid) at Rwēs, the Manāni' (sing. Mannā'i) in Abū Ẓulūf, and the Kubisa (pronounced Čibisa, sing. Čibisī) in the villages of the al-Zubāra area, with a sub-section of the Dusūm (sing. Desam) in Khuwēr. In the north-west are the semi-nomadic Na'īm with what are probably two sub-sections: namely, the Ka'abān (pronounced Ča'abān, sing. Ča'abī) who live inland in the north-east, and the Jafāfila in the area of al-Nuhayy. The other major area of settlement is al-Doḥa, Wakra and some surrounding villages. These villages belong to various members of the Āl Thāni family, while al-Doḥa is naturally the seat of government of H.H. the Ruler. Al-Doḥa has always been a fairly cosmopolitan town by reason of pearl fishing; the *Bombay Government Records* of 1856 gave Bida' a population of 400 rising to 1200 in the pearling season,[21] and the influx of non-Qaṭaris today has given rise to a large non-tribal population. It is beyond the scope of this article to classify all the tribal elements, but the remnants of several tribes, often of considerable importance in Qaṭar's history, are to be found in this area.

Geology

The surface of the Qaṭar peninsula consists primarily of lower Eocene limestone and gypsum overlain unconformably in the south and south-west by Miocene marls and limestone. The whole area is low-lying, but two main folds effect the relief. In the west is the Dukhān anticline in which lies the oilfield of Qaṭar, rising from the coast to a height of about 200 feet. It is about 35 miles long and 3–4 miles across. In the centre of the peninsula is a gradual swell, known as the mid-peninsular rise, exposing in places a limestone of slightly different character from the main limestone of the surface. In the south and on the southern end and eastern flank of the Dukhān anticline, the Miocene outcrops in sharply defined mesas and wind-eroded hills. Since the predominant wind in most of the Gulf is the north-westerly *shemāl*, blown sand covers much of the south of the peninsula and considerable areas of sand-dunes are found in the south-east.

Although the peninsula is structually contiguous with the Ḥasā Province of Saudi Arabia, it is separated by an area of salt flats many of which are of considerable size. Since the coastline of the whole of this part of Arabia is gently emergent, salt flats are encountered all along the coast of Qaṭar and salt flats link the bay of Salwā and Khor al-'Udēd, supporting the local tradition that Qaṭar was formerly an island.

For the purpose of treating topographical terms it will be convenient to divide the peninsula up into three areas: the main limestone plateau, the sandy south and the coasts.

The limestone plateau.—This is the region which is described locally by the term *barr Gaṭar*.[22] Although the plateau has been exposed since Miocene times, it exhibits

few of the classical features of karstlands and consists of swells (*ḥazm*, pl. *ḥezūm*)[23] and depressions.[24] The whole is covered with a mantle of debris known simply as *ḥaṣā*[25] or *ḥajar*. In some areas collapsed caverns have formed through solution and are known as *daḥl* (pl. *deḥūl*),[26] but where collapse is not complete and pools of water are not found in them they are known as *kharṣa'* (pl. *kherāṣi'*).[27] The term *ḥazm* is generic and there are several types. A high rocky hill is known as *'iḥzila*, whereas a small low mound is called *ḥdiba*.[28] The whole of the Dukhān anticline is known as a *maṣḥabiyya*,[29] but the separate hills which it forms are so large by Qaṭar standards that they are simply known as *jabal* (pl. *jibāl* or *jabalāt*). Wind-eroded hills which are prominent in the Miocene eastern flank are sometimes known as *gehāb*,[30] and the hills which form a very marked scarp with frequent outliers of soft white chalky limestone, capped by a harder limestone, are known as *briga* (*birga*) (pl. *birag*)[31] because of the brightness of the rock which makes them stand out clearly. The term *nakhsh* means "nose" and is used for a prominent spur as, for example, the southern plunging end of the Dukhan anticline. Two other terms, *gurn* (*ǧurn*) and *ṭewār* are also in general use in this area but will be dealt with later.

Rainwater collects in the depressions in the winter and these depressions have several names, the distinction sometimes being very fine. The place-names are often Umm or Abu (mother or father of, *i.e.*, possessor of) some natural feature, animal or tribal incident. The local explanations of these names are more often than not little more than rationalizations. The depressions are classified by vegetation, soil and size. Two main types can be distinguished: *rōḍa* (pl. *rōḍāt* or *riyāḍ*)[32] which is a semi-permanent grazing area with a well and a very low-lying grass called *naïim* covering it. The other type is called *jirī* (pl. *jiryān*). In it are found the *manga'*, usually towards the centre where the water lies, around which is hard pan (*miṣṭāḥ*, Cl. Arabic, *miṣṭāḥ*), this part without vegetation being called *ṣuna'*.[33] Leading into these depressions are small shallow valleys simply known as *wādī* (pl. *widyān*). Small short stream courses in which a little vegetation is found are called *shi'b* (pl. *she'ūb*).

In some areas of the plateau, especially east of the limestone scarp previously mentioned, are smooth plains (*rigga*)[34] with a surface of finer stones (*ḥashū*) and a reddish dust called *nēga*.[35]

The sandy south.—As the dust-charged north-west wind, the *shemāl*, blows across the peninsula it begins to deposit some of its load. At first the sand is deposited leeward of any small obstruction such as a tuft of grass, a deposit of this kind being known as *ramla*, and also in small depressions where it is called *bratha*.[36] The *ramla* develops into a long, narrow dune, called *'irg* (pl. *'urūg*, dim. *'arēg* (*'urēg*))[37] by the Āl Murra, and *sāḥib* (pl. *siḥḥib*, dim. *swēḥib*) by the 'Awāmir.[38] Both call a long, low-lying dune *'urgūb*.[39] Deposits larger than the *bratha* are found in *widyān* where they form low mounds known amongst the Āl Murra as *zubār* (pl. *zebāyir*) and amongst the 'Awāmir as *ḥdiba* (pl. *ḥdab*).[40] The next stage in the development of sand deposits is the individual crescent-shaped dune known to geographers as a barkhan. Amongst the Āl Murra of the area they are called *ṭi's* (pl. *ṭe'us*) though this word elsewhere appears to mean only a dune barren of vegetation.[41] The 'Awāmir use the word *khēṭ* (pl. *kheyūṭ*, dim. *khuwēyiṭ*).[42] These dunes have the apex of the crescent pointing at slightly different angles from NNW. to NW., which is the direction of the wind, and from this point two arms parallel to the direction of the wind are formed. The gentler-sloping, hard-packed, windward side is known as *ẓahr al khēt* and the steep, leeward side as *sayyāl*.[43] Towards the sea these dunes become interlinked to form a sand sea, such an area being called *nigyān* or *niǧyān*.[44] The singular *nigā* (or *nagā*) means a dune of unspecified type. Amongst these sand dunes

rise mesas, often quite large, with parallel rock strata called *ṭewār*.[45] Isolated horn-shaped hills or even small mesas are called *gurn* or *ǧurn* (pl. *gurūn*).[46]

Water in the area is rare and a well here is called *'ugla*. There are two popular etymologies as to the origin of this term: either it is that the wells are shallow with a depth not exceeding the length of an *'aqāl*, or else it means the place where a tribe stops and "ties up." Soil or rock scrapes in which rain water will collect are called *mishāsh*.[47]

The Coast.—As previously noted, the coastline of Qaṭar is gently emergent. The coastline itself is uneven. Among its natural features a cape is called *rās* (dim. *rwēs*), a bay *doḥa* and a narrow inlet *khor* (pl. *khērān*).[48] As a result, a number of low-lying offshore islands are to be found, particularly off the west coast, and in the shallow sea are coral reefs, (*fasht*, pl. *feshūt*)[49] and the pearl beds (*hēr*, pl. *hērāt*)[50] which in pre-oil days supported Qaṭar's population. The tidal range is low, the shore (*sīf*) between low tide (*māy thabur*) and high tide (*māy sagī*)[51] not being extensive. However, since the land is low-lying, the salt water (*māy kharīj*) is close to the surface and salt pans (*ṣbakha*, pl. *ṣebākh*)[52] are formed either by flooding at the highest tides or else by salt being drawn up by capillary action. A depression of the *rōḍa* type with sabkha bottom is called *wa'ab*. Low beaches are also encountered inland from the present beach and concentrated deposits of shells called *sabbān* (or *subbān*) or *zifzif*[53] are found in places.

It can be seen, even from this short survey, that topographical names vary considerably in the Arabian peninsula, and a comparison of the various specialized glossaries shows that a large number of the more exact terms seem to be purely local, particularly if they are of Bedouin provenance. The Persian Gulf itself shows more uniformity, but even here, within a small area, there are large divergencies.

In conclusion, the authors would like to thank Mr. J. Briggs, Assistant Commandant of the Qaṭar police, for his help and advice throughout the course of their work.

Notes on transcription

The transcription used in this article is a conventional one, with a few exceptions which show the Qaṭari pronunciation of certain consonants, vowels and diphthongs. These variants are as follows:—

Arabic letter	*Transcription*
jīm (j)	j and ǐ (the latter pronounced y or ī)
qāf (q)	g and ǧ (the latter pronounced j)
kāf (k)	k and č (the latter pronounced ch)
ḍād (ḍ)	ḍ } these two letters are both pronounced as Classical *ẓā*, vela-
ẓā (ẓ)	ẓ } rised dh, though they are kept separate in transcription.

The aim of the method of transcription has been to make it possible to transliterate again into Arabic, and this is the only virtue of the extra symbols ǐ and ǧ which differ in no way in pronunciation from yā and jīm respectively. The letter *e* is used to denote the neutral vowel *ĕ* which can arise from any of the short vowels. The Classical Arabic diphthongs *au* and *ai* are pure vowels in this dialect and are transcribed *o* and *ē* respectively. The vowel *o* is sometimes short, as in *khor*, and the transcription tries to show this. Names of well-known countries and towns are not given in exact transcription except where necessary, when they are first introduced.

REFERENCES

[1] It is beyond the scope of this article fully to discuss the question of this river. However, the idea of a river probably originated from mixed reports of the Wadis Sabhā and Job, the estuary-like Bay of Salwā and the complex of Sabkhas of the mainland around the base of the Qaṭar peninsula. Major R. E. Cheesman in "The deserts of Jafura and Jabrin" (*Geogr. J.* 65 (1925), pp. 112–41) helps to elucidate the problem and gives a list of some sources on this subject.

[2] Cf. Karsten Niebuhr, 'Voyage en Arabie' (Switzerland, 1780), maps. See also his 'Description de l'Arabie' (Amsterdam, 1774), pp. 294–5, for a short description of Qaṭar.

[3] Low, C. R., 'History of the Indian Navy' (London, 1877), vol. 1, p. 405.

[4] Cheesman, Captain R. E., "From Oqair to the ruins of Salwa," *Geogr. J.* 62 (1923), pp. 321–35.

[5] Or b. Khurdādhbeh, cf. pp. 60, 193, 'Kitāb al-Masālik wa'l-Mamālik' (Bibliotheca Geographorum Arabicorum), Ed. de Goeje (Leiden, 1889).

[6] Cf. D. H. Müller (ed.), 'Geographie der arabischen Halbinsel,' Leiden, 1884, pp. 47 and 137.

[7] Cf. The edition of 'Mu'jam al-Buldān' by Wüstenfeld (Geographisches Wörterbuch), Leipzig, 1870: I, 502, II, 453 (a village), II, 304–5 and IV, 135 (a village), 671.

[8] 'Lisān al-'Arab,' Beirut, 1955–6, under Qaṭar.

[9] 'The travels of Pedro Teixeira,' Hakluyt Society, ser. 2, vol. 9, 1902, p. 176.

[10] For example, to this period belongs "Asmā' al-Buldān wa'l-juzur wa ghayrhā" (*c.* 1780), a MS. on navigation belonging to a private collector in Kuwait, which mentions in its appendix a number of places on the Qaṭar coast with the latitudes and longitudes of some of them.

[11] Albuquerque does not appear to have visited Qaṭar though he visited Bahrain and Qaṭīf (cf. 'Memoirs,' Hakluyt Society, 1875–84).

[12] 'Selections from the Records of the Bombay Government,' No. 24, *Bombay Government Records*, 1856, p. 108.

[13] Palgrave, W. G., 'Central and eastern Arabia,' vol. 2 (London, 1865). The dispute over the veracity of Palgrave's journey of 1862–3 has recently been revived by Mlle Jacqueline Pirenne in her book 'A la découverte de l'Arabie' (Paris, 1958), and by H. St.J. B. Philby's review of this book in *Geogr. J.* 124 (1958), pp. 535–40. Since Palgrave's chapter on Qaṭar is of some historical importance in a study of that country, it is worthwhile seeing if any light can be thrown on the dispute by examining his description.

On the whole, Palgrave definitely gives the impression that he did visit al-Doḥa, but for the most part his descriptions are of such a nature that it is hard to pick him up on any specific point. There are two or three points which, on close examination, are shown to be inaccurate, but are the kind of mistake any traveller might make. On the other hand, there are two very definite errors which cannot be overlooked so easily. On p. 232 he says: "Ebn-Thānee, the governor of Bedaa', is indeed generally acknowledged for head of the entire province, which is itself dependent on the Sultan of 'Omān." Qaṭar was not dependent on the Sultan of Oman, and the very fact that Hermann Burchardt says that it is often falsely attributed to Oman may be to correct Palgrave's statement, though he does not mention his name. (See H. Burchardt, "Ost-Arabien von Basra bis Maskat auf Grund eigener Reisen," *Z. Ges. Erdk. Berl.* (1906), pp. 305–22.)

Palgrave's second error concerns the sites of Bida', Doḥa and Shaikh Qāsim b. Muḥammad Āl Thāni's castle. All these places are found today in Doḥa, the capital of Qaṭar. The name Bida' has been preserved and is now a quarter of the town lying north of the original Doḥa on the sea front. At the south end of the modern Doḥa towards Rās Abū 'Abūd, are found the ruins of Shaikh Qāsim's castle, still in reasonable condition, in an area called Suluṭa (so named from the tribe of that name). Palgrave stayed at Sh. Muḥammad's castle in Bida' according to his account and says: "My first visit was to Dowḥah, a village to the *North* of Bedaa'." (*Our italics.*) He also says that Shaikh Qāsim's castle "stands near the southern extremity of Bedaa'" and proceeds to describe it accurately. Now there is no doubt that the Bida' of today is the same as the Bida' of Palgrave's time, for in Philip's 'Imperial Library Atlas of the World' (1862 edition), *i.e.* at the period when Palgrave was making his journey, both Bida' and al-Doḥa are marked as two separate towns, the former being north of the latter.

On the other hand, the name Bida' was for long used in European books and maps to describe the whole bay and al-Doḥa is frequently not mentioned at all. If Palgrave was using Bida' in a general sense in the same way as al-Doḥa is used today, then it could be that Sh. Muḥammad's castle, where he stayed, was not sited in Bida' proper, but near Shaikh Qāsim's castle in Suluṭa (which in fact seems to be borne out by local tradition). This would explain

Palgrave's describing Muḥammad's castle as being in Bida' but still does not account for the error in describing "Dowḥah, a village to the North of Bedaa'." Burchardt, although admittedly some forty years later than Palgrave, bears out the division of the al-Doḥa of today into three: "Man unterscheidet jedoch drei beieinander liegende Ortschaften. Ed Docha mit der Garnison, El Bidaa und Es Solata."

[14] Burchardt, H., *op. cit.*, p. 312.

[15] Lorimer, J. G., 'Gazetteer of the Persian Gulf, Oman and Central Arabia,' 2 vols., Calcutta, 1908.

[16] Cf. R. B. Serjeant, 'A new map of southern Arabia,' *Geogr. J.* **124** (1958), p. 168, where he makes it clear that "the area to which a term relates should be specified, for it may not always be applied in quite the same way in other districts."

[17] Cf. J. G. Lorimer, 'Gazetteer,' vol. 2, pp. 1530–32.

[18] The *dīra* of a nomadic tribe is the area normally covered by it in its yearly travels. In the Arabic of the settled peoples of the Gulf the word means any large town.

[19] *I.e.* These tribes are so called collectively, though this is not the name of a tribal confederation.

[20] This is the largest settled tribe in Qaṭar. The *Bombay Government Records*, No. 24, 1856, pp. 390, 560 *et seq.*, say they numbered some 2000 men so that in those days they were proportionately larger, and from a description of the villages in which they lived and are not found in today, must have been far more extensively settled. The *Records* themselves say that they had formerly been a more extensive tribe before the arrival of the Āl Khalīfa. (The Āl Khalīfa captured Bahrain in 1783 from Zubāra with the aid of their kinsmen the Āl Ṣabāh of Kuwait and became the rulers of that country.) The Āl Bū Kawāra are of the same tribal group as the Ma'adīd from which comes the Āl Thānī, the ruling family of Qaṭar. They claim to be descended from the Banī Tamīm.

[21] *Bombay Government Records*, *op. cit.*, p. 559; H. Burchardt, *op. cit.*, p. 313, says the population rises by thousands in the pearling season.

[22] *Barr*, which means in literary Arabic, "land, continent," in the Persian Gulf means usually "desert." Here, however, it seems to have the meaning of "stone desert."

[23] This word, which is generally used in the Arabian Peninsula, seems to denote basically a piece of elevated ground, but to take on local overtones, connected sometimes with stone or rock. Cf. A. Musil, 'Manners and customs of the Rwala Bedouins' (New York, 1926) p. 679: "a rather narrow but long height sinking down into a plain steeply on the one side and gradually on the other. . . ." Socin, 'Diwan aus Centralarabien' (Leipzig 1900), vol. 3, p. 257, translates as "sand dune." C. Huber, 'Journal d'un voyage en Arabie' (Paris, 1891), p. 773: "terrains élevés et inégaux," p. 121: "longue colline basse qui sépare une légère dépression de terrain et empêche deux eaux arrivant de direction opposée de se réunir." But H. R. P. Dickson, 'Kuwait and her neighbours' (London, 1956), p. 595, describes it as "stony ground," and Wilfred Thesiger, "A further journey across the Empty Quarter," *Geogr. J.* **113** (1949), p. 43, as: "rocky mound on a ridge exposed in the sands."

[24] The word *khabt*—"depression"—does not seem to be generally understood in Qaṭar.

[25] Cf. H. St.J. B. Philby, 'Heart of Arabia' (London, 1922), vol. 1, p. 26, on the meaning of *ḥaṣa*.

[26] *Daḥl* is also Classical Arabic but in a slightly different sense. For the classical meaning of "reservoir," compare Huber, *op. cit.*, pp. 182–3 (*gbū'* and *Ṣuna'*). Used in the Qaṭari sense also in Musil, *op. cit.*, p. 677, Dickson, *op. cit.*, p. 592.

[27] It is locally believed that holes such as the *daḥl* and *kharṣa'*, are formed by meteorites. See W. Thesiger on *khasfa*: "Khasfa is the name given to any well reputed to have been made by a falling star. Nothing in the appearance of this well supported this theory." "A new journey in southern Arabia," *Geogr. J.* **108** (1946), p. 136, fn.

[28] *liḥzila* (*iḥzila*, *jiḥzila*) is not classical (but compare Cl. Arabic *iḥza'alla*) nor apparently used outside Qaṭar. *Ḥdība* is used in south Qaṭar as a kind of sand dune and is discussed in a later note.

[29] Compare below the usage of a related word amongst the 'Awāmir.

[30] The root means "gray, dust-coloured"; cf. with *abrag*, "bright."

[31] Compare the *Burgān* oilfield in Kuwait. This word, or alternative forms from the same root, is commonly used in the Arabian Peninsula. Cf. Dickson, *op. cit.*, under *abraq*, p. 588. Musil, *op. cit.*, *abraḳ*, p. 676. In Qaṭar this brilliant white rock has given the name *abrag* to a stratigraphic division at the top of the Eocene.

[32] This is, of course, a widely used term and is also Cl. Arabic, but the definition given above is in terms of local concepts. Cf. Dickson, *op. cit.*, p. 602: "wide, open vale or depression containing good grazing, owing to rainwater having formed a lake during winter and kept the

ground moist." Musil, *op. cit.*, p. 682: "lower ground in a level desert, into which silt is deposited by rainwater, producing a growth of perennials, sometimes even of annuals."

33 Huber defines *Ṣuna'* differently (cf. *op. cit.*, p. 183), namely as underground cisterns hollowed out of rock, as does Musil (*op. cit.*, p. 683) under *ṣen'*: "an artificial hollow in a rocky surface where rainwater remains." The words *jirī* and *manga'*, to the best of our knowledge, are not encountered elsewhere in the Gulf as topographical terms, though the latter has the related meaning of "swamp" in Cl. Arabic. *Jirī* can hardly have anything to do with "flowing" in this context.

34 The name for this kind of plain in the Trucial Coast is *sēḥ*.

35 White dust is called *nabgha*. The word *nēga* is not found as such but the root in Classical Arabic means reddish-white. Reddish sands are called elsewhere by a form derived from the root *aḥmar*. Cf. Thesiger, *op. cit.*, p. 44, *ḥamrūr*. *Nabgha* is also Classical Arabic.

36 In Classical Arabic this means "soft ground."

37 'Irg is a widely used term, cf. Thesiger, *op. cit.*, p. 33, "long high parallel dune chains 200–400 ft. high"; and in the same vein Dickson, *op. cit.*, p. 589 (*'arīq*): 'Encyclopaedia of Islam' (current ed.) under "Djazirat al-'Arab," "masses of sand following long single or parallel veins." But it is also used in this sense outside the area as far away as North Africa; cf. Boris: 'Lexique du parler Arabe des Marazig' (Paris, 1958), p. 401, *s.v.* "région de dunes."

38 The 'Āmirī root is used in north Qaṭar in the word *mashabiyya* (cf. note 30).

39 Huber has a different meaning (p. 568) for *'urgūb* as the path over a crescent-shaped dune (*qa'r*): cf. also Musil, *op. cit.*, p. 676, "a slope; steep rocky hillside."

40 *Zubār* is less generally used than *ḥdība*, which to the town-dwellers of Dubai on the Trucial Coast has come to mean any hill of sand. Rentz in 'Encyclopaedia of Islam' (under "Djazirat al-'Arab") defines the word (*ḥadaba*) differently, *viz.*, as "a plain with a mantle of gravel." Compare, too, Philby in his 'Arabian highlands' (New York, 1952), p. 59, where a similar meaning ("a bare, stony plain") is given to this word. Thesiger (*loc. cit.*, p. 44) comes nearer to the Qaṭari meaning with "high ground easy of ascent and devoid of special features." In north Qaṭar the word means only "a small low mound," cf. *supra*.

41 Rentz, *loc. cit.*, 'Encyclopaedia of Islam,' suggests this is the classical *di'ṣ*, as also the glossary (p. 672) to 'Arabia Deserta' (London, 1923, Doughty); cf., pp. 51, 776, Huber, *op. cit.*, where he defines the word as (p. 59) "petite colline blanche" and describes a crescent-shaped dune as *qa'r* (p. 568). Rentz defines a *ṭi'ṣ* as "a dune bare of vegetation," and Philby ('Heart of Arabia,' p. 319) as a "conical sand hillock."

42 Thesiger, *loc. cit.*, p. 43, calls these "parallel sand ridges similar to *'uruq* but smaller," whereas our informants gave them as their (*'Amirī*) word for *ṭi'ṣ* (crescent-shaped).

43 Thesiger gives different words: cf. *loc. cit.*, top of p. 44.

44 Cf. 'Encyclopaedia of Islam,' *loc. cit.*

45 Cf. Musil, *op. cit.*, under *ṭâr*, p. 683.

46 Cf. *J. R. Asiat. Soc.* N.S. 21 (1889): Jayākār, "The Omanee dialect of Arabic" (p. 845), gives this word in his glossary as "hillock."

47 This word is widely used, cf. glossary to the 1:2M map of Saudi Arabia of the Department of the Interior, U.S. Geological Survey (Misc. Geol. Investigations, Map 1–270 B-1) and Dickson, *op. cit.*, p. 600; Huber, p. 142; Musil, p. 681, etc.

48 Both *khor* and *rās* are commonly used in large areas throughout the Arabian Peninsula. *Doḥa*, on the other hand, seems to be a Gulf word (cf. Dickson, *op. cit.*, p. 592, and Rentz, *loc. cit.*).

49 Cf. 'Encyclopaedia of Islam,' *loc. cit.*; Dickson, *op. cit.*, p. 593.

50 Cf. *ibid.*, *loc. cit.*, The Gulf word for pearls is *gumāsh*, cf. Maḥmūd Bahjat Sinān, 'Al-Kuwait,' p. 147 (Beirut, 1955).

51 These are the words in general use from Kuwait to Ras al Khaima. *Sagī* is sometimes pronounced *sağī*.

52 *Ṣbakha* is the Classical Arabic *sabkha*. Rentz, *loc. cit.*, also notes the colloquial pronunciation for this word. *Sīn* and *ṣād* are frequently interchanged in Qaṭar and not always uniformly.

53 Philby, 'The Empty Quarter' (London, 1933) describes such shells in appendix B (p. 388).

CAREERS FOR GEOGRAPHERS

A memorandum of the Council of the Royal Geographical Society, prepared by the Education Committee

First edition, September 1949; *revised October* 1950, *April* 1954, *May* 1960

THE SOCIETY frequently receives requests from parents, university students, heads of schools, and others for information regarding careers open to those who have obtained an honours degree in geography. The Education Committee of the Society was asked to consider the matter and this Memorandum is the result.* It first describes the characteristic attitude of mind and outlook which results from a training in geography and shows how these are invaluable in a wide range of occupations for which clear thinking, broadmindedness and a wide human outlook are the chief requisites. It then examines and gives details of some more specialized careers for which the geographical training and knowledge acquired during the university course are of prime importance.

As an educational instrument, geography is among those studies whose virtue lies in the intellectual discipline and cultural training they afford. Unlike law, medicine or engineering, it does not often lead directly to a specific profession, but, like history or classical studies, it is valuable in broadening the mind and in promoting the habit of looking at problems in their all-round relations and not from any one specialist standpoint. It is moreover unique in the position which it occupies between the natural sciences and humanistic studies, a position which requires its students to combine an objective and scientific approach with powers of individual judgement and literary skill. In university circles it has won for itself the status of a serious discipline.

The trained geographer is accustomed to approach a problem from many different directions, just as he is accustomed to analyse a landscape from the point of view of many diverse branches of knowledge. He is able to balance the factors of a problem and see it as a whole, just as he is able to synthesize the elements of a landscape and see it in its unity. He develops the particular intellectual skill induced by the habit of seeking correlations of varied and apparently disconnected phenomena and of drawing together the data of natural and social investigation. This habit and intellectual skill are the fundamental assets of the geographer.

A trained geographer is therefore to be regarded as well fitted for employment that demands a wide scientific and human outlook. It must be recognized, however, that in many fields of employment greater importance is attached to individual qualities of character and personality than to the academic subject read for a university degree. This is as it should be; at the same time the educational value of geography in fitting a man or woman for a responsible position receives increasing recognition.

* This Memorandum was originally prepared by a sub-committee consisting of Dr. E. D. Laborde, Professor W. Gordon East, Dr. Alice Garnett, and Dr. E. W. H. Briault (Chairman), with the cooperation of the Executive Committee of the Geographical Association and Professor K. C. Edwards on behalf of the Conference of Heads of University Departments of Geography. It has now been very fully revised in consultation with members of the Council of the Society and others. The Education Committee of the R.G.S. express their warm appreciation to all those who have assisted in the preparation and revision of the Memorandum.

ground moist." Musil, *op. cit.*, p. 682: "lower ground in a level desert, into which silt is deposited by rainwater, producing a growth of perennials, sometimes even of annuals."

33 Huber defines *Ṣuna'* differently (cf. *op. cit.*, p. 183), namely as underground cisterns hollowed out of rock, as does Musil (*op. cit.*, p. 683) under *ṣen'*: "an artificial hollow in a rocky surface where rainwater remains." The words *jirī* and *manga'*, to the best of our knowledge, are not encountered elsewhere in the Gulf as topographical terms, though the latter has the related meaning of "swamp" in Cl. Arabic. *Jirī* can hardly have anything to do with "flowing" in this context.

34 The name for this kind of plain in the Trucial Coast is *sēḥ*.

35 White dust is called *nabgha*. The word *nēga* is not found as such but the root in Classical Arabic means reddish-white. Reddish sands are called elsewhere by a form derived from the root *aḥmar*. Cf. Thesiger, *op. cit.*, p. 44, *ḥamrūr*. *Nabgha* is also Classical Arabic.

36 In Classical Arabic this means "soft ground."

37 'Irg is a widely used term, cf. Thesiger, *op. cit.*, p. 33, "long high parallel dune chains 200–400 ft. high"; and in the same vein Dickson, *op. cit.*, p. 589 (*'ariq*): 'Encyclopaedia of Islam' (current ed.) under "Djazirat al-'Arab," "masses of sand following long single or parallel veins." But it is also used in this sense outside the area as far away as North Africa; cf. Boris: 'Lexique du parler Arabe des Marazig' (Paris, 1958), p. 401, *s.v.* "région de dunes."

38 The *'Āmirī* root is used in north Qaṭar in the word *masḥabiyya* (cf. note 30).

39 Huber has a different meaning (p. 568) for *'urgūb* as the path over a crescent-shaped dune (*qa'r*): cf. also Musil, *op. cit.*, p. 676, "a slope; steep rocky hillside."

40 *Zubār* is less generally used than *ḥdiba*, which to the town-dwellers of Dubai on the Trucial Coast has come to mean any hill of sand. Rentz in 'Encyclopaedia of Islam' (under "Djazirat al-'Arab") defines the word (*ḥadaba*) differently, *viz.*, as "a plain with a mantle of gravel." Compare, too, Philby in his 'Arabian highlands' (New York, 1952), p. 59, where a similar meaning ("a bare, stony plain") is given to this word. Thesiger (*loc. cit.*, p. 44) comes nearer to the Qaṭari meaning with "high ground easy of ascent and devoid of special features." In north Qaṭar the word means only "a small low mound," cf. *supra*.

41 Rentz, *loc. cit.*, 'Encyclopaedia of Islam,' suggests this is the classical *di'ṣ*, as also the glossary (p. 672) to 'Arabia Deserta' (London, 1923, Doughty); cf., pp. 51, 776, Huber, *op. cit.*, where he defines the word as (p. 59) "petite colline blanche" and describes a crescent-shaped dune as *qa'r* (p. 568). Rentz defines a *ṭi's* as "a dune bare of vegetation," and Philby ('Heart of Arabia,' p. 319) as a "conical sand hillock."

42 Thesiger, *loc. cit.*, p. 43, calls these "parallel sand ridges similar to *'uruq* but smaller," whereas our informants gave them as their (*'Amirī*) word for *ṭi's* (crescent-shaped).

43 Thesiger gives different words: cf. *loc. cit.*, top of p. 44.

44 Cf. 'Encyclopaedia of Islam,' *loc. cit.*

45 Cf. Musil, *op. cit.*, under *ṭâr*, p. 683.

46 Cf. *J. R. Asiat. Soc.* N.S. 21 (1889): Jayākār, "The Omanee dialect of Arabic" (p. 845), gives this word in his glossary as "hillock."

47 This word is widely used, cf. glossary to the 1:2M map of Saudi Arabia of the Department of the Interior, U.S. Geological Survey (Misc. Geol. Investigations, Map 1–270 B-1) and Dickson, *op. cit.*, p. 600; Huber, p. 142; Musil, p. 681, etc.

48 Both *khor* and *rās* are commonly used in large areas throughout the Arabian Peninsula. *Doḥa*, on the other hand, seems to be a Gulf word (cf. Dickson, *op. cit.*, p. 592, and Rentz, *loc. cit.*).

49 Cf. 'Encyclopaedia of Islam,' *loc. cit.*; Dickson, *op. cit.*, p. 593.

50 Cf. *ibid.*, *loc. cit.*, The Gulf word for pearls is *gumāsh*, cf. Maḥmūd Bahjat Sinān, 'Al-Kuwait,' p. 147 (Beirut, 1955).

51 These are the words in general use from Kuwait to Ras al Khaima. *Sagī* is sometimes pronounced *sağī*.

52 *Ṣbakha* is the Classical Arabic *sabkha*. Rentz, *loc. cit.*, also notes the colloquial pronunciation for this word. *Sīn* and *ṣād* are frequently interchanged in Qaṭar and not always uniformly.

53 Philby, 'The Empty Quarter' (London, 1933) describes such shells in appendix B (p. 388).

CAREERS FOR GEOGRAPHERS

A memorandum of the Council of the Royal Geographical Society, prepared by the Education Committee

First edition, September 1949; *revised October* 1950, *April* 1954, *May* 1960

THE SOCIETY frequently receives requests from parents, university students, heads of schools, and others for information regarding careers open to those who have obtained an honours degree in geography. The Education Committee of the Society was asked to consider the matter and this Memorandum is the result.* It first describes the characteristic attitude of mind and outlook which results from a training in geography and shows how these are invaluable in a wide range of occupations for which clear thinking, broadmindedness and a wide human outlook are the chief requisites. It then examines and gives details of some more specialized careers for which the geographical training and knowledge acquired during the university course are of prime importance.

As an educational instrument, geography is among those studies whose virtue lies in the intellectual discipline and cultural training they afford. Unlike law, medicine or engineering, it does not often lead directly to a specific profession, but, like history or classical studies, it is valuable in broadening the mind and in promoting the habit of looking at problems in their all-round relations and not from any one specialist standpoint. It is moreover unique in the position which it occupies between the natural sciences and humanistic studies, a position which requires its students to combine an objective and scientific approach with powers of individual judgement and literary skill. In university circles it has won for itself the status of a serious discipline.

The trained geographer is accustomed to approach a problem from many different directions, just as he is accustomed to analyse a landscape from the point of view of many diverse branches of knowledge. He is able to balance the factors of a problem and see it as a whole, just as he is able to synthesize the elements of a landscape and see it in its unity. He develops the particular intellectual skill induced by the habit of seeking correlations of varied and apparently disconnected phenomena and of drawing together the data of natural and social investigation. This habit and intellectual skill are the fundamental assets of the geographer.

A trained geographer is therefore to be regarded as well fitted for employment that demands a wide scientific and human outlook. It must be recognized, however, that in many fields of employment greater importance is attached to individual qualities of character and personality than to the academic subject read for a university degree. This is as it should be; at the same time the educational value of geography in fitting a man or woman for a responsible position receives increasing recognition.

* This Memorandum was originally prepared by a sub-committee consisting of Dr. E. D. Laborde, Professor W. Gordon East, Dr. Alice Garnett, and Dr. E. W. H. Briault (Chairman), with the cooperation of the Executive Committee of the Geographical Association and Professor K. C. Edwards on behalf of the Conference of Heads of University Departments of Geography. It has now been very fully revised in consultation with members of the Council of the Society and others. The Education Committee of the R.G.S. express their warm appreciation to all those who have assisted in the preparation and revision of the Memorandum.

Some particulars follow of the chief careers which geographers are now entering.*

A. *Business and Commerce.* An increasing number of business and commercial posts are being filled in which a knowledge of geography is particularly useful. Such posts vary greatly in character, but altogether they represent a steadily expanding opportunity for graduates in geography. They include managerial traineeships, secretaryships in business firms, posts in buyers', freight dispatch, and export departments of large firms, and in market research, and various posts at home and abroad in trading concerns dealing with particular commodities, such as oil, aluminium, motor vehicles, and the Mercantile Marine. A fourth year course leading to the Diploma in Personnel Management qualifies a graduate for employment in this aspect of business organization. Increasingly, posts are obtained in connection with the editing and production of books, periodicals, maps and educational films and film strips where an expert knowledge of geography is required. In journalism, in various branches of which graduates in geography are occasionally employed, it may be remarked that foreign correspondents, special correspondents, and leader writers would benefit by a deeper knowledge of geography than many of them now possess. Transport organizations, especially those dealing with shipping and aircraft, provide suitable work for geographers in such posts as traffic managers on long distance services. Among openings for research by geographers may be mentioned occasional posts with organizations such as the *Economist* Intelligence Unit. It is highly desirable that the usefulness in business and commerce of men and women with degrees in geography (especially if geography is combined with economics) should continue to be increasingly recognized. It is not merely that their particular study is broadly relevant to economic activities at home and abroad, but that their special training equips them to grapple effectively with fresh problems.

B. *Public Service.* Those with a university degree in geography are eligible to compete, with candidates who have followed other academic courses, for posts in the Administrative Class of the Home Civil Service and the Senior Branch of the Foreign Service where a very high standard of intellectual and personal qualities is looked for. Similarly a degree in geography is an acceptable qualification in candidates for H.M. Overseas Civil Service.

During and since the war, graduates in geography have been appointed to posts in various branches of the Civil Service at home and abroad. Recruitment to the Administrative Class of the Home Civil Service and to the Senior Branch of the Foreign Service is by means of open competitions (Method 1 and Method 2) conducted by the Civil Service Commissioners. Method 1 consists of a written examination similar to the university honours examination, and interviews: candidates can obtain all their marks for optional subjects in geography alone. Method 2 involves a short written examination in general subjects, and selection tests and interviews; candidates competing by this method must have a degree with at least second class honours. The graduate in geography can therefore compete for these Classes by both methods. Posts in the Civil Service for which graduates may compete may be summarized as follows:

(*a*) The Administrative Class of the Home Civil Service and the Senior Branch of the Foreign Service.
(*b*) The Special Departmental Classes.

* Inquiries regarding the various appointments mentioned in this Memorandum should be addressed directly to the responsible authorities, *not* to the Society.

(*c*) The Executive Class of the Home Civil Service and Branch B of the Foreign Service.

(*d*) Government Communications Headquarters (specialized posts).

There are certain permanent Government posts for which the trained geographer is particularly suited and is normally considered, but the total number of these specialized posts is comparatively small, and some of the following may become vacant only at rather long intervals.

(*i*) Research Officers and Assistants in the Ministry of Housing and Local Government are engaged on land use planning and, in particular, the study of proposals contained in development plans. There are also research posts of interest to geographers in the Ministry of Defence (in the Joint Intelligence Bureau) and a few posts are filled each year from the Special Departmental Classes competition listed above. There are also research posts in the Ministry of Agriculture, Fisheries and Food.

(*ii*) Civil Hydrographic Officers in the Admiralty are chiefly concerned with the preparation and correction of Admiralty charts. Graduates in geography with good honours degrees and preferably with subsidiary mathematics or languages are appointed from time to time.

(*iii*) Map Research Officers are employed in the map library of the Directorate of Military Survey in the War Office and Map Curators in the map library of the Directorate of Overseas Surveys.

(*iv*) Overseas Survey. There are at present a number of vacancies for surveyors. Apart from surveying qualifications, a degree in geography is a good preparation for the Colonial Survey training course, but either subsidiary mathematics or physics is essential. Graduates in geography without a training in survey may undertake a twelve months' course at either University College London, or the Survey Training Centre, Newbury, to enable them to qualify for appointment.

(*v*) Vacancies under the Nature Conservancy and the National Parks Commission occur from time to time. A few of these are specifically for geographers, others are open to highly qualified graduates including geographers.

(*vi*) Geographers find employment with the British Council, the Imperial Plant Bureau, the Soil Survey of Great Britain, the Hydraulics Research Station, and River Boards.

(*vii*) A certain number of vacancies occurs in overseas areas especially in the Commonwealth, in what may broadly be called public service. Examples are the Soil Survey and Land Use Division of the Ghana Department of Agriculture, locust survey work in Africa and overseas research institutes such as the Rhodes-Livingstone Institute.

C. *Planning*. Recognition has already been given to the geographer in this field. By reason of his training, he has clearly an important contribution, with the architect, the economist, and the civil engineer, to make to the planning work undertaken by the Ministry of Housing and Local Government and by Local Planning Authorities (Counties and County Boroughs). Openings for geographers in the former have been mentioned above (see B (*i*)). The Local Planning Authorities regularly employ geographers in specialized posts concerned both with research and survey and in general planning work. The latter posts are, however, mainly filled by architects, engineers or surveyors who are also members of the Town Planning Institute, and geographers in these general grades are normally expected to become members in due course by passing the Institute's examination. It has recently been decided that candidates with approved degrees in geography should

be admitted direct to the final examination of the Town Planning Institute. Successful candidates in this examination are qualified for Associate Membership, subject to satisfying the Council as to their practical town planning experience. It should be emphasized that geographers entering the field of planning must undertake further training. This may take the form of full-time study, as for example, for the Master of Civic Design degree at the University of Liverpool.

D. *Teaching*. Many geography graduates take up teaching and it is to be hoped that there will continue to be a good supply of specialists to meet the needs in education at home and overseas. Graduates entering teaching should follow a one-year course of training at an Institute or Department of Education or a training college before beginning their career. These courses lead to the postgraduate certificate in education which will eventually become an essential qualification for graduates wishing to enter teaching. Graduates who have undertaken this course satisfactorily are entitled to an additional training increment under the Burnham Report.

The overwhelming majority of schools of all types now recognize that geography is an essential part of a good education. In the General Certificate of Education, Ordinary Level, the numbers offering geography have steadily increased until they are now greater than those offering all but four other subjects, accounting in 1958 (summer) for 100,472 out of 1,274,768 subject entries. At Advanced Level, there were 9475 entries in geography out of 177,524 subject entries altogether, the number offering geography being exceeded by those in only five other subjects.

Geography is, fortunately for the needs of the schools, strongly developed in the training colleges for teachers, the current expansion of which will result in an increased demand for experienced and well-qualified specialists. Applicants for posts in these colleges should have some years' experience of teaching. The subject also continues to grow both in numbers and in status in universities at home and in the Commonwealth, most of which have geography departments under one or more professors. Appointments as lecturers or assistant lecturers require qualifications in geographical research.

It will be clear from what has been said that a training in geography leads directly to certain careers; that it leads readily to other careers if followed by further specialist training; and that, as with other subjects, it can lead to successful employment in a wide variety of fields. In these fields particularly, more depends upon intellectual ability and qualities of character and personality than on the subject studied at the university. Nevertheless, geography is a subject which gives a discipline and habit of mind likely to be of great value in many walks of life. In some of these this is already recognized; in others the Society wishes that such recognition was more widespread. No responsible person, journalist or politician, business man or administrator or whoever he may be, can correctly think out problems connected with countries whose geographical background he does not know. And such knowledge cannot be picked up in a moment. The use of geography to the sailor, soldier and airman is so obvious as to need no emphasis.

The Society has been encouraged by the steady increase, since this Memorandum was first published, in the recognition given to the value of a geographical training and in the opportunities open to geographers.

EXPLORATION AND SURVEY ON THE BOLIVIA–PERU BORDER

W. H. MELBOURNE

IN MID-JUNE 1959, a party of six student members* of Imperial College, University of London, under the leadership of Dr. Geoffrey Bratt, left England to explore a mountain region of the South American Andes in Bolivia. The expedition had the support of the Imperial College Exploration Board, the Mount Everest Foundation and the Royal Geographical Society.

The mountain group that we visited was called the Nudo de Apolobamba. This means the knot of the Apolobamba, and it is so named because it is here, on the border between Bolivia and Peru, that the two chains of the northern Andes join into one.

We arrived in the Apolobamba by way of the Bolivian capital, La Paz, which nestles in a huge hollow in the *altiplano* (plateau) at about 13,000 feet above sea level. Dominating the bustling modern city are the ice peaks of Illimani, a giant mountain rising to over 21,000 feet and looking almost close enough to touch, although it is actually 25 miles distant. Over half the population of the city are the colourful Aymara Indians. The women in particular are gaily dressed in shawls and skirts and petticoats of every colour of the rainbow, and everyone is bedecked with a bowler hat; these hats come in several different shades, and even the little girls wear them, although they are often so large as to fall down over their eyes.

The Indians in La Paz either run little open-air stalls to sell their food products and handicrafts, such as clothes and ponchos made from the tough llama wool, or they are servants and labourers. There were quite a few of the stalls devoted to selling herbs and oddly shaped articles for curing all ills; one of the most gruesome exhibits being the dried and shrivelled embryo llamas which they would try to cover up if they saw a camera. There were many nostalgic memories in La Paz, and in most of the villages for Geoff Bratt and myself, both Australians, because of the thousands of eucalyptus trees. The cold, clear, high-altitude air carries the strong scent of these gum trees, and occasionally a waft of the burning wood. They were imported from Australia by the Englishmen who built the railway line over half a century ago.

In La Paz we were met by Señor G. Farwig, the President of the Club Andino Boliviano, whose members were to be our hosts for the entire time that we were in Bolivia. They were wonderfully friendly and no small part of the success of the expedition was due to their help. The British Embassy in La Paz also gave us a great welcome and were extremely helpful to us. Several days after arriving in La Paz we were bouncing along in one of the Club's trucks over the desolate wastes of the *altiplano* towards the shores of Lake Titicaca. On the way we passed many trucks loaded high with farm products from nearby villages and, perched on top, about two dozen Indians all headed for a few days in the big city. One of the trucks carried the most unusual load of huge chunks of ice which were cut from a nearby glacier for sale in La Paz.

The villages were frequent round the shores of Lake Titicaca, with clean-looking houses built of mud bricks and with thatched roofs, but as we headed north they became fewer and smaller until eventually in the distance we caught sight of the ice peaks of the Apolobamba mountains. The truck left us about 10 miles from the village of Pelechuco, where we went to try and hire some mules to take us farther

* The party consisted of Geoffrey Bratt, W. H. Melbourne, J. W. Jenkinson, A. Ewart, A. W. Smith and P. Garrard.

into the mountains. It took three days to obtain the mules and ponies because no one wanted to leave during the fiesta which was being held at the time. On these feast days a large amount of a "firewater" which the locals call *alchul* is consumed and they dance on and on until they drop. In fact, this drink is like raw methylated spirits though not as foul as the *chicha*, the drink fermented with human saliva, which I was also given to drink. Although local people are nominally Christian they wear the most grotesque and un-Christian masks. Pelechuco was the centre of an ancient Spanish mission and the old church still stands near the central square, a building ten times the size of anything else in the village; about half way through the fiesta everyone trooped through the old church with hand-carved candles which they do not light, but presumably save for the next time.

After several days marching with the mules and ponies we set up a base camp at the snout of the large Azucarani Glacier. It was about this time that we were feeling the effects of our rapid rise from sea level to 17,000 feet. Headaches were common, and several of the party who had come up in three days were vomiting after any strenuous work; it took about five days for these symptoms to disappear. However, we were always very conscious of the rarified atmosphere and any exertion made us breathless; movements were slowed down and, particularly in the first weeks, conversation while walking or climbing was virtually prohibited.

At this stage Ewart and Garrard left us for over four weeks to make a geological traverse northwards over the Apolobamba mountains and down towards the Amazon basin. They took with them an Aymara Indian porter named Venancio. His surreptitous attempts to lighten his own load and to teach them to live off the land had very little success; however, no objections were raised to the two handsome lake trout which he obtained from a little village by the barter of three empty porridge tins. Much later in the expedition Venancio caught some of the viscatua—small rabbit-like animals—which infest the lower screes and moraines, living in natural burrows in the rock. His greatest catch was a vicuña, which provided some good fresh steaks to boost the diet of dehydrated food. The vicuña is rather similar to an antelope and its beautiful soft fur is much prized for making coats.

The rest of us, namely Bratt, Jenkinson, Smith, myself and Caraffa, a Bolivian who accompanied us for the first two weeks, started to set up a camp high on the side of the Azucarani Glacier. From here we embarked upon several ascents in the Matchu Sochi Conchi group, in an endeavour to locate some of the peaks which had been intersected during a border survey carried out by a team of surveyors under the direction of the Royal Geographical Society about fifty years ago. These intersected peaks were then used as the base for the plane-table survey which was carried through the entire central area of the Apolobamba. The map made from this topographical survey of 170 square miles is reproduced here on a folding sheet. It was on one of these earlier climbs that we reached the summit of the Pelechuco Huaracha, just over 18,500 feet. The summit was of a most unusual ice formation, being shaped like a very steep-sided ridge tent with a 15-foot tunnel running through the middle about 30 feet under the top ridge.

The whole central area of the Apolobamba was heavily glaciated, and Bratt and Jenkinson made a detailed survey of the snouts of fifty-one of the glaciers in the area. Both retreating and advancing glaciers were found and measurements were made of their rates of flow. The fronts of many glaciers were reaching past old terminal moraines and covering plants which were at least ten years old. The Azucarani Glacier was particularly interesting because of its rather inexplicable stepped crevasses. These were a most unusual formation of 20–30 foot ice cliffs which terraced the glacier about every 50 yards and no satisfactory reason has been put forward to explain their regular formation over an area of 2–3 square miles.

The Soral Este peak was one of the most difficult climbs which we tackled and entailed a long approach including the crossing of the Azucarani Glacier. Over the glacier we set up our tents on a ledge of rock high above the valley. Opposite towered the south face of the Soral Este peak, with its ice-falls dropping nearly vertically from the cone-shaped summit to the glacier below. It was a far more forbidding prospect than we had imagined and any thought of an approach from this side was right out of the question. The following morning a reconnaissance party went out to see if there was a possible approach from the other side. After bivouacking for the night in a miserable snowstorm they returned to say that brief glimpses through the cloud had shown that the north side looked possible, although still very steep. Two more days were spent on the rock ledge weathering out the storm before we set out on the strenuous march round to the back of the Soral Este peak, with eight days' food, paraffin fuel for the stoves and equipment on our backs, a load totalling about 60 pounds—which means quite hard work at 17,000 feet.

For the first time now we struck the cloud which rises almost every midday from the steaming Amazon jungles to the north, which made it impossible to do any plane-table surveying in the afternoon, and was also a menace to the climbing. Our first attempt on the summit along the east ridge was forestalled in the last 1000 feet of the ridge by huge cracks in the ice and several formidable overhanging cornices.

Next morning we tried the more direct route on the northern face, which had originally been rejected because of the rotten and loose nature of the rock face. We started out in the bitingly cold air just after sunrise, after a quick breakfast of porridge oats soaked in coffee. We intended to climb a steep ice gully leading to a narrow ridge 1000 yards short of the summit. However, after a short time it became obvious that this route would be dangerous, because of the thin covering of ice on the rock which flaked away under our crampons in a most alarming fashion.

The only alternative left was to move out of the gully and climb the 300 foot rock face itself which was free of ice to the ridge. After two hours of sometimes delicate work, leading out about 80 feet each time on the nylon ropes, we reached the top of the face under a slightly overhanging rock shelf. We moved carefully from here on to the ridge, and then alternately on rock and ice until we reached the base of the final 300-foot conical summit. We stopped to put on crampons again, and, cutting occasional steps with the ice axes, moved up the last few feet to the summit.

After several more days' work in the Soral Este area we re-crossed the Azucarani Glacier and returned to an old gold mine, the San Antonio, where we met Ewart and Garrard. The gold was mined from a quartz reef at 16,000 feet, just below the snout of one of the smaller glaciers on Palomani. The last two weeks were spent carrying the geological and topographical survey northwards to the 20,000 foot Chupi Orco snow dome and up the glaciers on the north side of the Soral Oeste peak. From a high camp on the glacier we climbed the Soral Oeste peak and so completed our climbing objectives. This peak had been attacked twice before from the south, but the attempts had been defeated by the exasperating, deep, soft snow lying on the south facing slopes.

After one and a half months in the mountains our time was drawing to a close and we made our way back down Lago Suches. Here we were met by Señor Farwig, who, by an amazing feat of manoeuvring, had driven a small bus up into the mountains as far as Suches. On the way down we saw many species of geese and ducks and Señor Farwig shot some of these to take back to La Paz. During our stay in the Apolobamba we had completed a geological survey of 500 square miles, an accurate topographical survey of 170 square miles, and had reached the summits of fourteen previously unclimbed peaks over 18,500 feet.

DISCUSSION

Evening Meeting, 11 January 1960

Before the paper the PRESIDENT (The Rt. Hon. Lord NATHAN) said: Ladies and gentlemen, this evening we are to hear a lecture about a region with an alluring name, Apolobamba, or rather Nudo de Apolobamba. In other words, the joining point of the Andes of Peru and Bolivia. We are very glad to see the Bolivian Ambassador here to take full care of the interests of the Bolivian Andes. The lecture today is to be given by two of the youngest lecturers we have had upon this platform. Their expedition to the boundaries of Bolivia and Peru was organized from the Imperial College of Science and Technology of which the Rector, Sir Patrick Linstead, is here today. We at the Royal Geographical Society, just up the road from where he holds sway, have supported some forty expeditions from Universities in the last year or a little more. It has been one of our aims to encourage explorations by the younger generation, but there is no body that has, during these past years, been more far-sighted or forthcoming in support of such expeditions than the Imperial College of Science and Technology. I think it says a great deal for its forward view under the guidance of its distinguished rector.

Now these two young men have been engaged upon this expedition together. They are going to speak to you, not together, but successively. One of them, Mr. Melbourne, comes from Australia. The other, Mr. Garrard, comes from East Anglia. We are going to have an interesting exposition from them of what they, as young men, seeking a piece of adventure and also doing an honest piece of scientific work, have done during the recent past and I now ask Mr. Melbourne to begin and then afterwards Mr. Garrard.

Mr. Melbourne and Mr. Garrard then read their paper

The PRESIDENT: That was the most modest recounting of a most remarkable adventure. The amount of work done in it was kept in the background and only the more agreeable features were shown to us. I think it must have been good for these young men to be in Bolivia—on the borders of Bolivia and Peru—just as it must have been good for those with whom they came in contact locally to have met these two young British men, who showed such qualities of resolution and effort. Well, now, here is His Excellency the Bolivian Ambassador, and we would all, I know, like to hear what he may have to say.

H.E. THE BOLIVIAN AMBASSADOR: Mr. President, ladies and gentlemen, I must congratulate these two young men for the magnificent work they have done on their expedition. To those who know the country, what they did was quite a feat. Apolobamba is one of the highest mountains in my country, and, as you know, Bolivia and Peru, in that section of the world, compete favourably with the Himalayas. Climbing those mountains, therefore, is something that has to be recognized. Their description and their comments about my country and its people have been clear and simple and deserve our hearty congratulations.

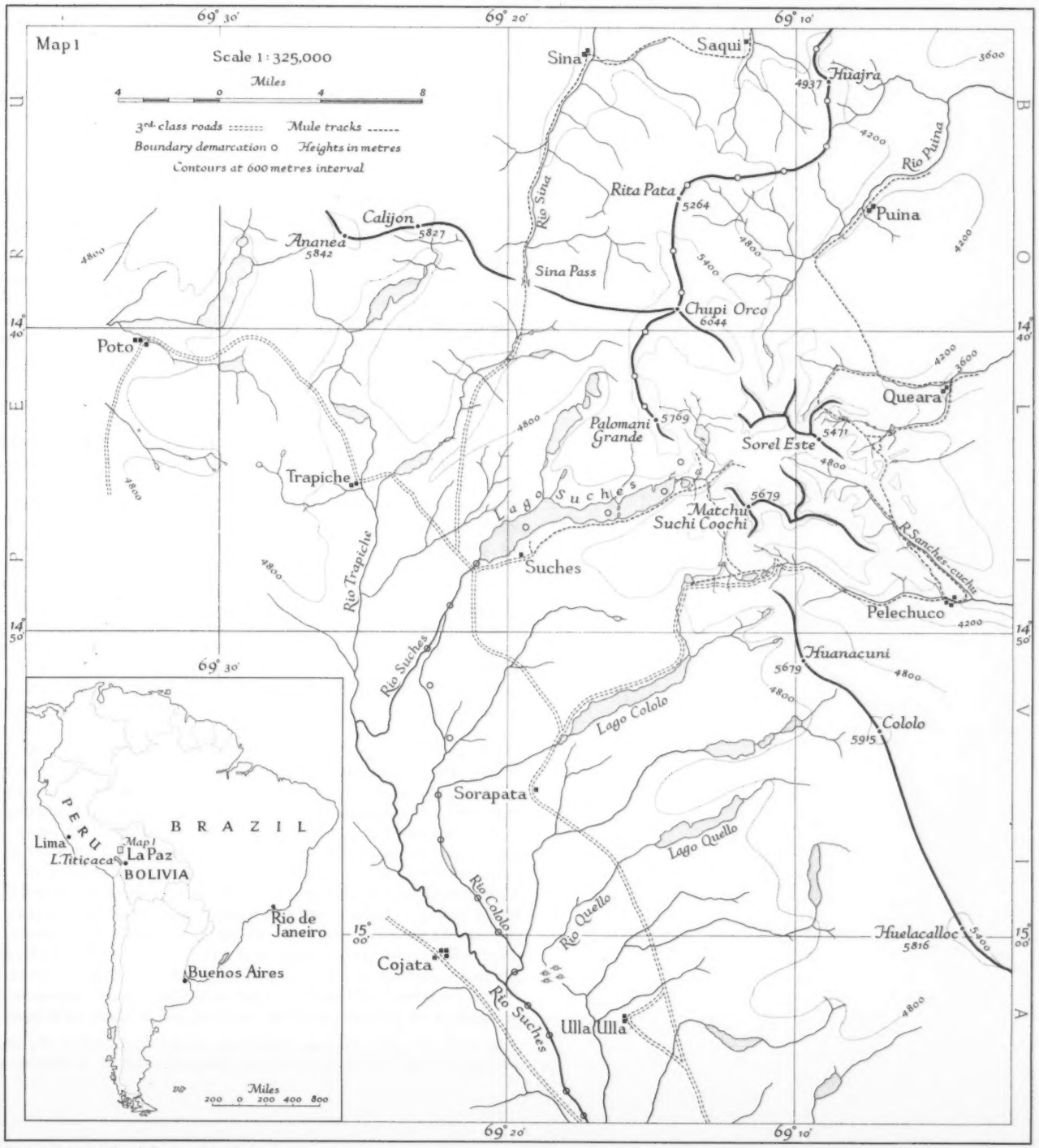
I must congratulate, too, the Royal Geographical Society that gives such opportunities to these expeditions. And I must congratulate finally but not in a minor way, the Imperial College of Science and Technology which helps such expeditions financially and in other ways. I am very thankful for what I have seen and heard and for the way in which a small part of my country has been presented to you.

The PRESIDENT then called upon Sir Patrick Linstead.

Sir PATRICK LINSTEAD: Mr. President, Your Excellency, I would like to take the opportunity of joining in the congratulations to Mr. Melbourne and Mr. Garrard, and the others in this expedition which we did a little to help. And I would like to thank His Excellency for his kind remarks. We are very proud to have had these two young men as members of the Imperial College.

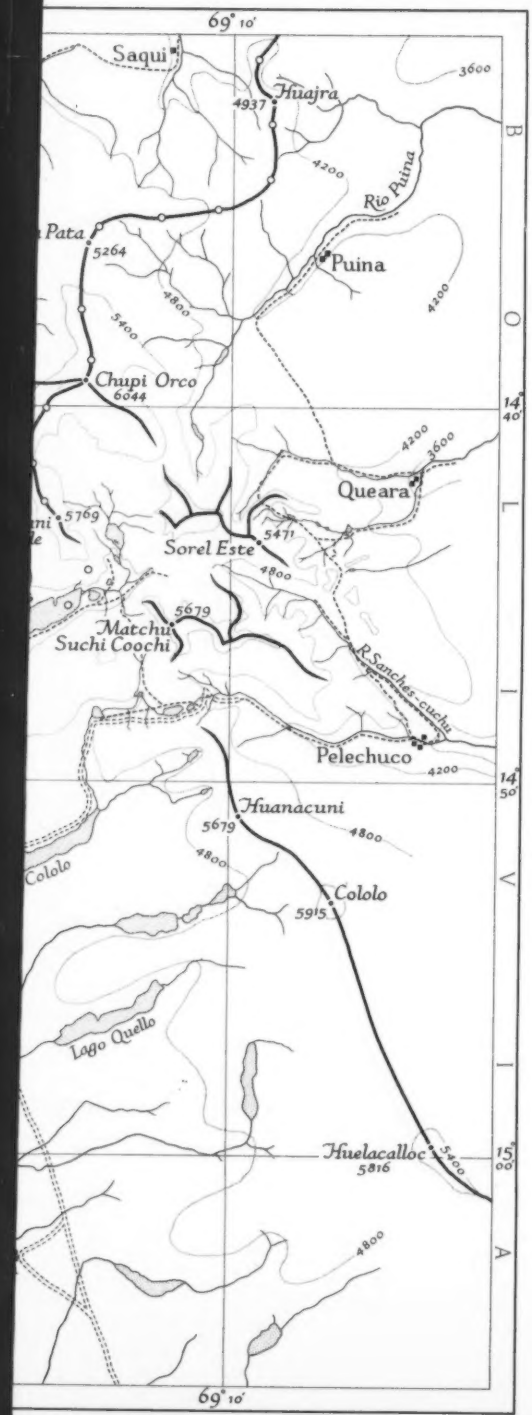
Corrections to Map: For Sorel read Soral throughout; for Matchu Suchi Coochi read Matchu Sochi Conchi.

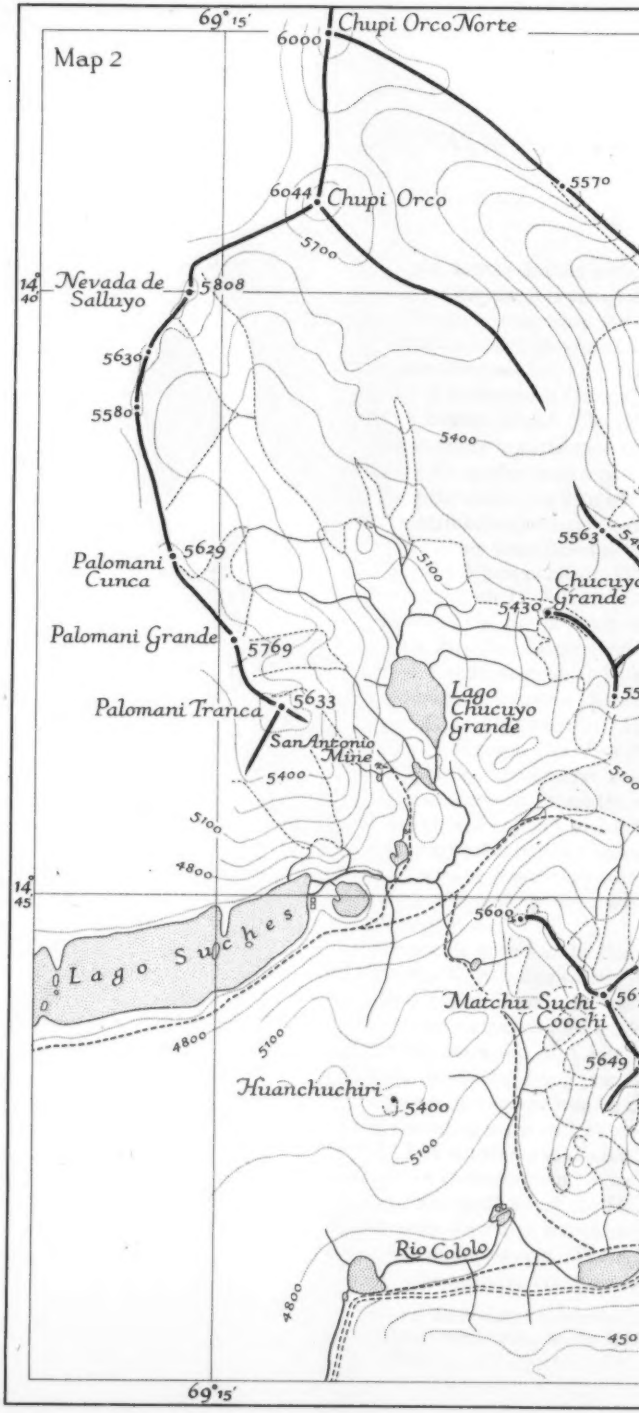
NUDO DE APOLOBAMBA Surveyed by W.H.Mell



Published by the Royal Geographical Society

O DE APOLOBAMBA Surveyed by W.H.Melbourne, Imperial College 1959





69° 10'
69° 5'
Scale 1:100,000
Miles
1 0 1 2 3 4
3rd. class roads
Mule tracks
Glaciers
Huts
Heights in metres
Contours at 150 metres interval
Río Sorel
5230
4800
4500
5100
5400
5320
5030
Queara
5641
Sorel Oeste
5570
Sorel Este
5471
Azucarani Glacier
Azucarani
5580
Paso de Queara
4770
14° 40'
14° 45'
5640
5679
5649
Pelechuco Huaracha
5630
Katantica
5592
5610
5200
4600
Pass
Río Sanches-cuchu
Paso de Pelechuco
4850
4200
Pelechuco
69° 10'

MELBOURNE

CAPTAIN ALEXANDER MACONOCHIE, R.N., K.H., 1787–1860

R. GERARD WARD

IN MANY WORKS dealing with the history of geography as an academic discipline in Great Britain, it is stated explicitly, or assumed, that "university geography in Britain began in 1887 when the Royal Geographical Society (founded 1831)* offered Oxford and Cambridge grants towards the stipends of lecturers."[1] In fact, Captain Alexander Maconochie, R.N., K.H., first Secretary of the Geographical Society, held the post of Professor of Geography at University College London from November 1833 to August 1836.[2] The primary purpose of this paper is to gather together the fragmentary material now available on that period of Maconochie's life when he was actively employed as a geographer. In so doing, the paper will mark the centenary of the death of a man who in at least two fields, geography and penal reform, made contributions which were far ahead of those of most of his contemporaries and which for many years failed to receive the acknowledgement they deserved.

Alexander Maconochie (or M'Konochie as he spelt his name until 1832) was born in Edinburgh on 11 February 1787. As his father died in 1796, Maconochie was placed under the guardianship of Allan Maconochie, Lord Meadowbank. This was fortunate, for Allan Maconochie was a man whose "learning was so varied and considerable that he seemed 'to be equally at home in divinity, agriculture, in geology, in examining mountains, demonstrating his errors to a farmer, and refuting the dogmas of the clergyman. . . . He questioned everything, his whole life was a discussion'."[3] It seems clear that Alexander's wide interests, intellectual curiosity and indefatigible enthusiasm for study, writing and discussion stem largely from the stimulation received during the seven years he was under Allan Maconochie's care. It is also clear that many of Allan Maconochie's interests were related to geography and this too probably had a bearing on Alexander's later career. The immediate aim of his education, however, was to prepare him to enter the law. But in August 1803, at the age of fifteen, he was, as he himself stated, "enabled, with much difficulty, to break away to sea."[4]

Maconochie served under the Honourable Sir Alexander Cochrane off Spain and later in the West Indies where, in the course of the sieges and capture of several of the West Indian islands, he was twice wounded. In addition to his regular duties Maconochie maintained his studies, especially in modern languages and mathematics. When stationed off Cadiz late in 1809 he was able to continue his study of Spanish. In the following year Maconochie, by now a Lieutenant, joined the brig *Grasshopper* and in her was on convoy duty in the Baltic. On 24 December 1811, whilst returning home with a convoy, the *Grasshopper* was taken by the Dutch off the Texel. The remainder of the convoy, including "four line-of-battle ships and almost 200 sail of merchantmen,"[5] was lost in the storm which drove the *Grasshopper* amongst the sandbars off the Helder. Upon being captured the crew of the *Grasshopper* were forced to march over 400 miles in mid-winter to Verdun, where the officers were imprisoned. There, meeting an English lawyer who had been interned, Maconochie resumed his study of law, but upon his release in 1814 he rejoined the

* In fact, the Society was founded, as the Geographical Society of London, on 16 July 1830. It was later incorporated as the Royal Geographical Society by Charter dated 8 February 1859. [*Ed.*]

fleet and was soon stationed off the American coast. He was present at the assault on Washington and at the Battle of New Orleans. Shortly afterwards he was given command of the brig *Calliope* and on 8 September 1815 he was promoted Commander. As was then customary he was thereafter referred to as Captain. Having been paid off in 1815, Maconochie remained on half-pay until he was retired with the rank of Captain on 17 February 1855.[6]

After his retirement from active service, Maconochie returned to Edinburgh where "he employed himself diligently in study and writing." [7] It was whilst there that he published his first pamphlet.[8] This paper was a revised version of a memoir which he had submitted to the Secretary of State for War and Colonies and the Lords Commissioners of the Admiralty, advocating that Britain set up a commercial colony in the Hawaiian Islands. Maconochie hoped that if the plan were accepted he might be employed to carry it out.[9] He presented a well-argued case for such a colony and in so doing showed a firm grasp of affairs in the Pacific area. He expressed concern with Russia's expansion on the south-east coast of Tartary and north-west of America, and argued that military advantages would accrue from Britain's possession of a colony in the central north Pacific. Such a colony would help Britain keep watch on Russian expansion as well as protect the East India Company's sphere of activities. It would stimulate Britain's "languishing commerce in the Pacific Ocean" [10] by acting as a base for whalers, a distribution point for British manufactures, a revictualling point and a staging post between Asia and North and South America. He had in mind a commercial colony of the type which Raffles established three years later at Singapore. However, the Board of Trade reported that "'as such a settlement could not be obtained without incurring a very considerable expense, and as the advantages are at all events doubtful, the Committee does not think fit to recommend it.'" [11]

Two years later Maconochie's longest single work appeared and again one of his major aims was to set out the advantages which would result from the establishment of a central free port within the Pacific Ocean. But the book was far more than a simple revision of his earlier work. Under the title 'A Summary View of the Statistics and Existing Commerce of the Principal Shores of the Pacific Ocean . . .' [12] Maconochie aimed to correct what he considered to be a "singular apathy and indifference" [13] to, and ignorance of, the Pacific. The work is important as a careful study of the area, with emphasis being placed on those factors (both physical and cultural) which might influence trade. No less than two-thirds of the book is devoted to a general survey of the area. When he wrote the work Maconochie had not visited the Pacific so that the whole survey is based on the observations of others. He seems, however, to have chosen his sources carefully and critically. The accounts of von Humboldt, Cook, Vancouver, Lewis and Clarke, D'Entrecasteaux and Mariner are amongst his many sources. One cannot help but be impressed by the width of reading and study which must have gone into the preparation of the work. The fact that the book was published less than three years after he returned to Edinburgh indicates that he had the ability to work quickly and disproves his own assertion that he led an "idle life" [14] after leaving the Navy.

In handling his sources Maconochie appears to have made every effort to assess them critically and if he was in doubt about the accuracy of any source he made this clear with comments to the effect that "the authority is not . . . the best." [15] An interesting example of Maconochie's search for reliable, first-hand sources is available in a note he published in *Blackwood's Magazine* in 1818.[16] From this it appears that, where possible, Maconochie communicated with people who had had personal experience in the territories on which he was writing. In this case he received an

account of the Philippines from a gentleman, "J.G.," who had dwelt there for a number of years. It is obvious that Maconochie had asked him for answers to specific questions relating to population, land forms, trade, agriculture and climate. Unfortunately for Maconochie, the reply did not reach him until after the book had gone to press. But this was fortunate for us as Maconochie's separate and apparently verbatim publication of the account provides us with a little extra insight into his methods.

Having collected a wealth of factual data, Maconochie avoided encumbering his work "with a tedious nomenclature" or giving unnecessarily "minute enumeration [which] would be only tedious."[17] Rather he presents well-ordered descriptions, supported by statistics, which show his skill in weaving together material from many sources. His "geographer's touch" is shown clearly in numerous passages which display an appreciation of the interrelation of various phenomena in a particular area. As one reviewer noted, his argument for a free port "is considered in great detail, and its interest is essentially heightened by the connection of its operation with a great many local objects of pursuit, such as Captain M.'s minute research into the history and statistics of the several shores of the Pacific has assisted him in discerning, and in the consideration of which his previous summary enables his readers to accompany him."[18] The same reviewer concluded that the effect of the "speculations in this very interesting and entertaining little volume," which incidentally covers 365 pages, is "further heightened by an exceedingly precise and perspicuous general arrangement."[19] His descriptions are often vivid and frequently penetrating. Three quotations from the book give an indication of his ability to describe and highlight the relationships between phenomena. Writing on "Russian America" he describes how:

> "incessant torrents of rain, in an especial manner, characterize the short-lived summer of these desolate shores, and the immediate effect of these is to produce a rapid and forced vegetation in the low and sheltered corners, which are alone susceptible of it; but the early return of winter soon chills the opening prospect, nor have the esculent grains ever been known to ripen under their influence. The hardier species of forest timber, together with some grasses and garden vegetables, are alone found to survive the quick recurring vicissitudes, and even of them, the former run principally to brushwood, scarcely ever being found of vigorous growth, or considerable diameter. (p. 71.)
>
> [The Spanish South American Colonies are] separated from each other by almost impassable wastes; the population has no common or united feeling; no intrinsic bond of alliance beyond the feeble tie thrown over them by their common origin. They neither supply each other's wants, nor minister to each other's strengths; the history of their obedience to the parent state was ever characterized, accordingly, by local but most destructive famines; and that of their rebellion is now equally marked by disunion or dissension. (p. 21.)
>
> The whole [Papuan] archipelago is strikingly alike in its principal features of climate, soil, and vegetable productions; the first being sultry on the coasts, and cooling gradually in ascending the mountains, which everywhere characterize the interior; the second rich and fertile; and the last forming a mixture of the bread-fruit, cocoa nut, and plantain of the Pacific, with the areca, wild nutmeg, iron-wood, ebony, and other forest woods of the Indian Archipelago." (pp. 197–198.)

It would be interesting to know exactly what prompted Maconochie to write on the Pacific and to write in such a clearly geographical manner. The evidence is sparse, however, and permits nothing more than the comment that such an interest was typical of educated men of his time and class. "The interest in geography had been fostered by the great Napoleonic wars, then happily ended. Dozens of

demobilized officers of the Navy and Army had turned to exploration as an outlet for their energies."[20] In Maconochie's case it was really armchair exploration of a thorough type. Perhaps Maconochie's geographical bent may be attributed both to his guardian's interests and guidance and to his acquaintance with Captain Tuckey, author of a work on "Maritime geography."[21] Maconochie and Tuckey were fellow prisoners of war in France and while in captivity Tuckey "devoted his leisure to this laborious compilation."[22] In his writings, however, Maconochie gives no real indication of having been influenced by Tuckey.

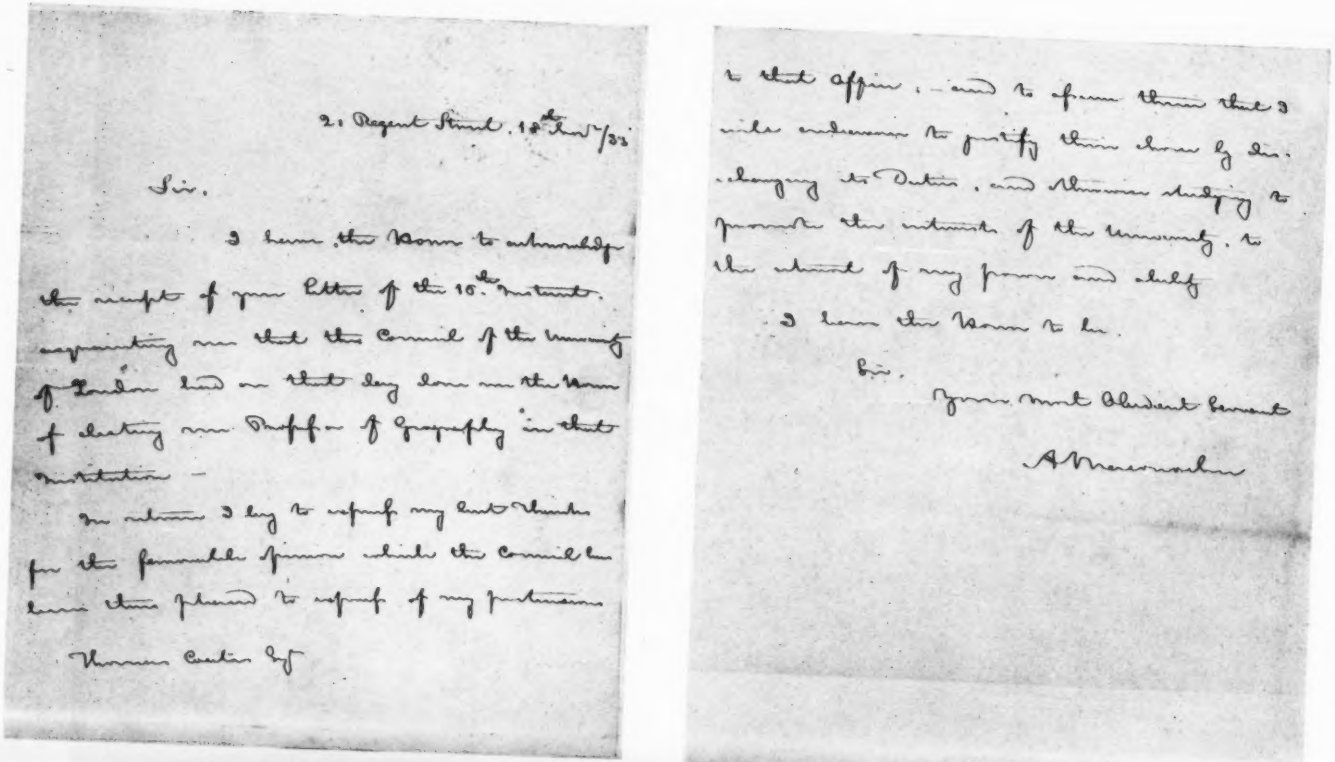
In view of his later interest and career in the field of prison reform the section of 'A Summary View . . .' which deals with New South Wales is of particular interest. In a section on the "Political constitution" he is critical of the authoritarian form of administration and of the suitability of the colony as a place for a corrective prison. He goes on to state that the "most important object [of a prison] is the reform of convicts, not their punishment only, and still less their exile"[23] and then propounds four "first principles" of penal science. On at least one of these principles—separate imprisonment—he later changed his views. The fourth principle—that the prisoners' "very liberation ought to depend upon their own exertion, not solely upon the lapse of time"[24]—is one of the basic ideas on which his later theories of prison discipline were based. After setting out these principles Maconochie considers the disabilities under which New South Wales suffers and briefly outlines a proposal for "penitentiary houses" as places of imprisonment and reform. It appears that this section represents the first occasion on which the man who has been called "the father of modern penology"[25] set out his views on the subject. In fact this is apparently the only occasion on which he published any views on prison reform prior to the preparation of his famous 'Report on the State of Prison Discipline in Van Diemen's Land, etc.'[26] As far as is known he did nothing during the next seventeen years to advance the cause which was to absorb most of his energy in his later life.

On 10 April 1822 Maconochie married Mary Hutton Browne and in the following year the couple went to live on a farm at North Queensferry, Fife. Whilst there he built a school and, until a teacher could be obtained, taught the children of the neighbourhood himself.[27] Farming proved "not . . . very profitable"[28] and in about 1828 Maconochie and his family moved to London.

Once in London, Maconochie was soon associated with "many old friends—among them were Sir John Barrow, Sir John Franklin, Admiral Beaufort and other originators of the Royal Geographical Society."[29] Not unnaturally he was "among the foremost promoters of the Society"[30] and at the inaugural meeting on 16 July 1830 he was appointed Secretary, a post which he held until his resignation in May 1836. By all accounts Maconochie appears to have filled the post with energy and ability. His tasks were many. In addition to normal secretarial duties the Council Minutes of the Society record that he was primarily responsible for negotiations with "Mr. Murray (Albemarle Street)"[31] *re* the publication of a journal; for the purchase of books and maps[32]; the handling of negotiations for apartments for the Society[33]; and the "immediate management of the finances of the Society."[34] Even if some of the financial details were handled in a rather informal or haphazard manner,[35] no great harm came of it. In contrast the way in which he edited the Society's Journal was exceedingly thorough. As the Council recorded, "all the papers [published in the Journal] . . . have undergone the most rigid scrutiny on his part, to insure their accuracy, and many . . . are wholly due to the zeal and labour with which he has abstracted the most valuable matter from documents too voluminous to be published *in toto*."[36] None of the papers or communications in the first six volumes of the

By courtesy of K. J. Maconochie

Captain Alexander Maconochie, R.N., K.H. *By E. V. Rippingille, 1836*



2 Regent Street. 18th Nov 1833

Sir.

I have the honor to acknowledge the receipt of your letter of the 10th instant, appointing me that the Council of the University of London had me that day done me the honor of electing me Professor of Geography in that institution —

In return I beg to express my best thanks for the favourable opinion which the Council have thus pleased to express of my pretensions

I have the honor to be

Sir.

Your most Obedient Servant

A Maconochie

to that office, — and to assure them that I will endeavour to justify their choice by devoting to Duties, and Honors studies to promote the interests of the University, to the utmost of my power and ability

I have the honor to be

Sir.

Your most Obedient Servant

A Maconochie

Alexander Maconochie's letter of acceptance of the first Chair of Geography at London University

By courtesy of University College London

Journal appear under his name but evidently he was responsible for many of the unsigned contributions.

One important aspect of his work was concerned with the Society's aim of fostering exploration. He was closely connected with the organization of Captain Back's expedition to the Arctic and with the negotiations resulting in the Government's granting of £1000 towards the expeditions of Alexander in Southern Africa and Schomburgk in British Guiana.[37] It was no doubt in recognition of these services that Maconochie Island (off Adelaide Peninsula in the Canadian Arctic) was so named.

Maconochie's energy and ability evidently won the respect of the Council and the Fellows. An extraordinary situation arose, however, in December 1835, when a member of Council, Mr. W. D. Cooley, charged Maconochie with "misleading the Council, with mis-stating and mystifying their proceedings in the Minute Book, with sacrificing the interests of the Society to particular objects, and in general with misconduct as Secretary of the Society."[38] Both Cooley and Maconochie thereupon tendered their resignations and a Committee of Council was appointed to investigate. Cooley refused to put his charges in writing and had no real evidence to support them. The Committee reported that "Mr. Cooley has totally failed in substantiating any of the charges above mentioned."[39] The Council requested Maconochie to resume his duties as Secretary and assured him that their confidence in his "straightforward and honourable conduct and their high opinion of his valuable and zealous services for the best interests of the Society remain undiminished."[40] Mr. Cooley's resignation was received.

It was while he held the post of Secretary of the Royal Geographical Society that Maconochie became the first Professor of Geography in Great Britain. The first mention of geography as a possible subject of study at the University of London (as University College London was then called) occurs in a University Council Minute of 29 June 1833 when the question of a Chair of Geography was deferred.[41] The following month the Senate recommended that the Committee of Management "take measures for appointing Professors of History, Geography, The Arts of Design, and Mineralogy."[42] Some time between then and 11 September 1833, Thomas Coates, Secretary of the University, approached Captain Beaufort with the suggestion "that if the Society would bestow a small endowment on this Chair the nomination of the Professor would be ceded to it."[43] Beaufort discussed the proposal with Maconochie and agreed that the Society's finances would not enable it to endow the chair. In the same letter in which he conveyed this decision to Coates, Maconochie commented that Beaufort had been urging him to make himself a candidate for the chair and, although not agreeable at first, he was now "more reconciled" to the suggestion. He requested some unofficial indication of his chances of appointment.[44] On 25 September Maconochie formally applied for the chair[45] and Captain Beaufort provided a testimonial in support of the application.[46] Stating that he gladly acceded to Maconochie's request for a testimonial, Beaufort went on to say that:

> the character he [Maconochie] has established and the talents he has displayed as Secretary to the Geographical Society, must render any individual recommendation superfluous.
>
> I shall confine myself to two points,—the knowledge that he possesses—and his power of imparting it to his pupils.
>
> With respect to the first, I am not acquainted with any person who has acquired a greater stock of accurate geographic information,—or who has larger and sounder views on that widely comprehensive subject—or who can more clearly convey that information, or illustrate those views by apposite and interesting facts.

Alexander Maconochie's letter of acceptance of the first Chair of Geography at London University.
By courtesy of University College London

> But the second point—the power and habit of communication,—is a far more essential quality in a lecturer, and it is on this ground that I consider him to be peculiarly suited to the vacant chair—The unwearied zeal with which he pursues every object that he undertakes—the benevolent warmth which he feels towards young people—the pleasure he derives from giving instruction, joined to the experience he has had in education,—and the fluency with which he can vary his explanations so as to adapt them to the different capacities of the class—all these appear to me to constitute the true characteristics of a public teacher.

Apparently the Senate agreed with Beaufort's assessment and on October 17 recommended that Maconochie be appointed.[47] On 16 November 1833 the University Council appointed him to the first Chair of Geography to be established in the country.[48] Two days later Maconochie accepted the appointment.[49]

The precise date at which Maconochie began to teach in the University is uncertain but was probably not until late in 1834.[50] The exact content of his teaching is likewise unknown. The Faculty of Arts stated in 1835 that geography's "object is to explore the portion of space allotted to man, to portray his habitations therein, diversified as they are in geological structure, in climate, in vegetation, in animal life; to show their connection with his form, his habits, the temper of his mind, his language, his laws, his institutions; and to deduce general principles, by which, under similar circumstances, similar results may be inferred."[51] It is a reasonable assumption that, as Maconochie had been teaching in the University for a whole year when this statement was written, it reflects his views on the subject. Late in his life Maconochie wrote that "the branch of geography to which my attention was most devoted was what may be called ethical or political geography. It directed my thoughts to the effect of varying circumstances upon the character of those subjected to them."[52]

We know little about the contents of Maconochie's teaching. On at least two occasions he gave public lectures in the University and attracted large audiences. In January 1834 not less than 350 people heard him speak on the recent expeditions of Captain Ross in the Arctic and Captain Burnes in Central Asia.[53] A year later he spoke on the interior of Southern Africa and the area south of British Guiana. These were the areas to which the Royal Geographical Society was about to send the expeditions of Alexander and Schomburgk. On this occasion *The Times* recorded that "the lecture, which was very well-delivered, and illustrated by maps, etc., gave the greatest satisfaction to all present."[54] Obviously successful as a public speaker, Maconochie was less successful in attracting students to his regular classes. In 1835 there were five students enrolled for geography out of a total of 136 in the Faculty of Arts. This was a smaller number than in any other subject, though German (six) and political economy (seven) were scarcely larger though longer established.[55] There is little doubt that Maconochie devoted a considerable amount of energy to his professional duties. His various requests that a classroom be modified and equipped in a manner suitable for the teaching of geography and that globes, maps and diagrams be obtained indicate a lively interest.[56] Shortly after his appointment he was taking a part in University affairs as a member of a Committee of Senate[57] and a year later he was concerned in the negotiations which eventually led to the granting of the University of London Charter.[58]

The end of Maconochie's career as a geographer came abruptly. On 1 April 1836 Sir John Franklin was offered the post of Lieutenant-Governor of Van Diemen's Land[59] and "he was very anxious that his friend Maconochie should accompany him."[60] Franklin hoped that Maconochie might be appointed Colonial Secretary but this post had just been filled. Eventually Maconochie agreed to accompany Franklin as his private secretary on the assumption that, once in Van Diemen's Land,

a more responsible post would be found for him.[61] On 9 May 1836 Maconochie indicated his intention of resigning his post of Secretary of the Royal Geographical Society and on 23 May the Council received his resignation.[62] The Council proceeded to pass a most laudatory resolution regretting his resignation and recording their appreciation of his work. On Maconochie's recommendation, Captain Washington, R.N., was appointed his successor.[63] During the same month, Maconochie was nominated Knight of the Royal Hanoverian Guelphic Order (K.H.).

Maconochie's formal letter of resignation as Professor of Geography was not written until 22 August 1836 and not received by the University Council until November 5.[64] The Council immediately set about advertising the vacancy. Unfortunately the University was less successful than the Royal Geographical Society. During the next year at least five persons applied for the vacant chair, but none of them was a "person whose eminence would justify the appointment."[65] The last mention of the vacancy in the University Council Minutes occurred on 25 November 1837. Thus a notable experiment in geographical education ended for lack of a suitable successor to the first Professor.

Maconochie never returned to the field of geography in any formal capacity, though he did retain his interest in the subject. From Van Diemen's Land he sent several papers to the Royal Geographical Society and at least one of these, "On the Soil and on the Natives of Port Phillip in Australia," was read at a meeting of the Society.[66] In 1845 he published a lengthy paper which included a thorough account of the geography of Norfolk Island.[67] These writings, however, were incidental to what had by then become his main interest.

Prior to his departure from England he was asked by the Society for the Improvement of Prison Discipline to report on the treatment of convicts in Van Diemen's Land. Appalled by the conditions he found to exist in the penal colony, Maconochie carried out his investigation with characteristic energy and thoroughness. He himself testified that his "long and devoted study of political geography" helped him to perceive the manner "of the practical working of all the elements of society together in a short time"[68] and he was thus able to complete his survey within a few months. Without his knowledge, the report was published as a Parliamentary Paper and the furore which was aroused when its contents became known in Hobart virtually forced Franklin to dismiss him.[69] From then until the end of his life Maconochie devoted most of his time and much of his financial resources to the cause of prison reform. He published many pamphlets and articles describing the evils of the existing system and setting out his proposals for a new form of prison management. It was as the originator of the "Mark System of Prison Discipline" that he became most widely known.[70] On two occasions he was given posts in which he might experiment with his theories, but in fact the existing law prevented his ideas being given a full trial. Nevertheless he had considerable success in reforming prisoners while Superintendent of Norfolk Island (1840–4). Officially it was considered that this experiment failed, but in fact it was notable that less than three per cent. of the convicts who had been under Maconochie's control were reconvicted in the first year after discharge compared with 9 per cent. of those who had served their sentences in Van Diemen's Land.[71] Circumstances beyond his control prevented any marked success when he was Governor of Birmingham Gaol (1849–51). Despite failing health the last nine years of his life were devoted to writing and campaigning for the cause of prison reform. Although in his own time the visible results of his reform work were few, "the influence of his ideas has [since] extended throughout the world, notably in English and American penal reforms."[72] Maconochie died at Morden, Surrey, on 25 October 1860, at the age of 73.

It would be an interesting, if unrewarding, exercise to muse on the course geography might have taken in British universities had Maconochie stayed longer at University College. The very existence of a Chair of Geography at such an early date is significant as a reflection of the importance which the subject had at that time. It was very fortunate that a man of such marked ability as Alexander Maconochie was available to fill the post and his resignation was a serious blow to the development of the subject. The fact that a successor was not appointed, despite a desire by the University to do so, is an indication that his fellow members of Senate found it difficult to find another person of equal calibre to take his place. If a successor had been found, and had he devoted even half the energy and ability to the subject that Maconochie had done, it is unlikely that geography would have had to wait fifty years before being reintroduced into a British university.

Acknowledgements.—The author is most grateful for the assistance received from many people in the course of preparation of this paper. Particular thanks are due to the Council and Staff of the Royal Geographical Society for the privilege of access to, and help in using, the Society's archives; to Dr. H. C. Darby and his colleagues at University College London; to the Librarians at University College London and the Mitchell Library, Sydney; to the Honourable Mr. Justice Barry; and to Kenneth J. Maconochie, great-grandson of Alexander Maconochie. Finally, the author would like to express his appreciation of the help received from all those, too numerous to name individually, who responded to his press request for information. Without their help many fragments of the story might have remained hidden.

NOTES AND REFERENCES

[1] Tatham, G., "Geography in the nineteenth century," in G. Taylor (Ed.), 'Geography in the twentieth century,' 3rd edition, London, 1957, p. 68.

[2] The mistake may well be due to reliance on H. R. Mill's 'Record of the Royal Geographical Society 1830–1930.' In this work Mill inferred (p. 40) that as the Society, in 1833, had declined to bestow a small endowment on a proposed Chair of Geography at the University of London, no such chair was established. Mill himself published a most gracious apology and correction (*Geogr. J.* **81**, 6 (1933) pp. 536–8) but this appears to have been generally overlooked. It is interesting to note that a similar situation exists in writings on the history of academic geography in the United States. Both Hartshorne ("The nature of geography,' 2nd edition, Lancaster, Penn., 1948, p. 23) and Tatham (*op. cit.*, p. 68) credit Arnold Guyot with being the first Professor of Geography (Princeton, 1854) in the United States, whereas both the Rev. John Daniel Gross (1785–95) and John Kemp (1795–9) were Professors of Geography at Columbia half a century earlier. (*Pers. Comm.*, Columbiana Library, Columbia University, New York, 10 June 1960.)

[3] 'Dictionary of National Biography,' Vol. 35, 1893, p. 257.

[4] "Captain Maconochie, R.N., K.H.," in M. D. Hill, 'Our Exemplars, Poor and Rich, or Biographical Sketches of Men and Women who have by an Extraordinary use of their Opportunitites benefited their Fellow-Creatures,' London, 1861, p. 214. This work, which is partly autobiographical, is the main source for early biographical data. Other information is available in W. R. O'Byrne, 'A Naval Biographical Dictionary,' London, 1849, pp. 707–8. The Honourable Mr. Justice Barry's excellent study, 'Alexander Maconochie of Norfolk Island,' Melbourne, 1958, deals primarily with Maconochie's career as a prison reformer but includes most of the biographical data which is available.

[5] Maconochie in Hill, *op. cit.*, pp. 217–18.

[6] O'Byrne, *op. cit.*, p. 708, and Barry, *op. cit.*, p. 9.

[7] Barry, *op. cit.*, p. 9.

[8] M'Konochie, A., 'Considerations on the Propriety of Establishing a Colony in one of the Sandwich Islands,' Edinburgh, 1816.

[9] *Ibid.*, p. 3.

[10] *Ibid.*, p. 11.

[11] Quoted by Maconochie in a manuscript note dated 30 January 1817 and inserted in the British Museum's copy of the pamphlet.

[12] The full reference and title is M'Konochie, A., 'A Summary View of the Statistics and Existing Commerce of the Principal Shores of the Pacific Ocean. With a Sketch of the Advantages, political and commercial, which would result from the establishment of a Central Free Port within its Limits, and also of one in the Southern Atlantic *viz.* within the territory of the Cape of Good Hope, conferring on this latter in particular, the same privilege of direct trade with India and the Northern Atlantic, bestowed lately on Malta and Gibraltar.' London, 1818.

[13] *Ibid.*, p. ix.

[14] Maconochie in Hill, *op. cit.*, p. 220.

[15] M'Konochie, 'A Summary View . . .,' p. 116.

[16] "J. G.," "Details Respecting the Philippine Islands," *Blackwood's Magazine*, 3 (1818) pp. 576–9.

[17] M'Konochie, *op. cit.*, pp. 211 and 127.

[18] *Blackwood's Magazine*, 3, (1818) p. 698.

[19] *Ibid.*, p. 701.

[20] Mill, H. R., 'The Record of the Royal Geographical Society 1830–1930,' London, 1930, pp. 7–8.

[21] See footnote in M'Konochie, 'A Summary View . . .,' pp. 94–5.

[22] *Ibid.*, p. 94.

[23] *Ibid.*, p. 175.

[24] *Ibid.*, p. 177.

[25] Walter C. Reckless, University of Ohio; quoted in Maconochie, K., "Captain Alexander Maconochie, R.N., K.H.; Sociologist and Prison Reformer," *The Howard Journal*, 9, 3 (1956) p. 235.

[26] "Report on the State of Prison Discipline in Van Diemen's Land etc. by Captain Maconochie," *Parl. Papers*, 1837–8, [121] Vol. XL, pp. 237–51. Some of the earliest attacks on Maconochie's views, as set out in the above report, contended that he had gone to Van Diemen's Land with preconceived ideas on prison discipline, having already "made a close study of the subject." (K. Fitzpatrick, 'Sir John Franklin in Tasmania 1837–1843,' Melbourne, 1949, p. 155.) Historians of Tasmania and biographers of Franklin (*e.g.* Rev. J. West, 'History of Tasmania,' Launceston, 1852; H. D. Traill, 'Life of Sir John Franklin,' London, 1896; Fitzpatrick, *op. cit.*), have often assumed this to be true. Barry (*op. cit.*, pp. 17–21) shows clearly that such assumptions are unjustified. It must be agreed, however, that, twenty years before going to Van Diemen's Land, Maconochie had given some thought to the topic of prison discipline. This was by no means "a close study of the subject" and is scarcely sufficient to invalidate Maconochie's own assertion that, prior to his arrival in Van Diemen's Land, he had "not previously studied the subject of punishment" (Maconochie, in Hill, *op. cit.*, p. 221). It is certainly insufficient evidence to invalidate (on the grounds of preconceived conclusions) the findings of Maconochie's detailed study of conditions existing in Van Diemen's Land when he arrived there.

[27] Barry, *op. cit.*, p. 11.

[28] Maconochie, in Hill, *op. cit.*, p. 220.

[29] *Loc. cit.*

[30] Markham, C. R., 'The Fifty Years' Work of the Royal Geographical Society,' London, 1881, p. 35.

[31] R.G.S., 'Council Minute Book 1830–1841,' Minutes 18 and 29 December 1830.

[32] *Ibid.*, 26 March 1831.

[33] *Loc. cit.* and *ibid.* 28 April 1832

[34] *Ibid.*, 23 May 1836.

[35] Maconochie to Washington, 29 August 1836; 24 October 1837; and 23 May [1839]. R.G.S. Archives.

[36] R.G.S., *Council Minute*, 23 May 1836.

[37] Mill, *op. cit.*, p. 45, and R.G.S. *Council Minute*, 14 August 1834.

[38] R.G.S. *Council Minute*, 21 December 1835.

[39] *Loc. cit.*

[40] *Loc. cit.*

[41] University College London (U.C.L.) *Council Minutes*, 29 June 1833.

[42] *Ibid.*, 6 July 1833.

[43] R.G.S., *Council Minute*, 28 September 1833.

[44] Maconochie to Coates, 11 September 1833. U.C.L. Library. The Council of the R.G.S.

later confirmed the decision of Beaufort and Maconochie *re* the endowment of the chair. (R.G.S. *Council Minute*, 28 September 1833. See also H. R. Mill, "The First London Professor of Geography," *Geogr. J.* **81**, 6 (1933) pp. 536–8.) It is interesting to note that in the same letter (11 September 1833) Maconochie suggested that a friend, Rev. Robert Vaughan, would be a suitable candidate for the Chair of History. Vaughan was in fact appointed to that post on the same day as Maconochie was to his.

45 Maconochie to Coates, 25 September 1833. U.C.L. Library.

46 Beaufort to Coates, 21 September 1833. U.C.L. Library.

47 U.C.L. *Council Minute*, 2 November 1833. There were four applicants for the Chair including Maconochie. The other three were Mr. Jean Chretien, Mr. George Pinnock and the Rev. N. S. Smith.

48 *Ibid.*, 16 November 1833.

49 Maconochie to Coates, 18 November 1833.

50 Maconochie to Coates, 12 November 1834. In this letter he begins by saying "the Geographical Class having now commenced in the University . . ."

51 Extract from 'Report of the Faculty of Arts,' in *Distribution of Prizes*, Session 1834–5. Quoted in Mill *op. cit.*, p. 537.

52 Maconochie in Hill, *op. cit.*, p. 221. See also K. Maconochie, *op. cit.*, p. 236. In this paper Kenneth Maconochie states that Alexander Maconochie's "study of history, geography, natural and moral philosophy, led him to form an evolutionary theory based on the postulate that the key to all social and historical development was to be found in the continual interreaction of man and his environment."

53 *The Times*, 17 January 1834; 5 c.

54 *The Times*, 15 January 1835; 6 f.

55 University of London, *Proceedings at Annual General Meeting; Report and Appendix*, 24 February 1836, London 1836, p. 16.

56 Maconochie to Coates, 12 November 1834; 16 June 1835, U.C.L. Library.

57 *Ibid.*, 12 March 1834.

58 *Ibid.*, 19 March 1835.

59 Glenelg to Franklin, 1 April 1836, quoted by Fitzpatrick, *op. cit.*, pp. 44.

60 Woodward, F. J., 'Portrait of Jane,' London, 1951, p. 197.

61 Barry, *op. cit.*, p. 16.

62 R.G.S. *Council Minute*, 23 May 1836.

63 Maconochie to Washington, 7 October 1837, R.G.S. Archives.

64 Maconochie to Coates, 22 August 1836 U.C.L. Library, and U.C.L. *Council Minute*, 5 November 1836.

65 *Annual Meeting of Proprietors, 22 February* 1837, quoted in Mill, *op. cit.*, p. 538.

66 R.G.S., *Minute Book*, Vol. 2, 10 November 1834–June 1840, p. 213, R.G.S. Archives. Amongst the other papers submitted were "A Sketch of the Structure of Van Diemen's Land" and "On the Expedition to Africa and British Guyana [*sic*] with a report of the Expedition Committee," R.G.S., *Catalogue of Authors' Papers*, R.G.S. Archives.

67 Maconochie, Captain, "Criminal Statistics and Movement of the Bond Population of Norfolk Island to December, 1843," *Quart. Statist. Soc.*, **8** (1845) pp. 1–49. Barry (*op. cit.*, p. 134) refers to this paper as "a pioneering effort of great competence in the then virtually unknown field of penal statistics and classification. . . ."

68 "Report on the State of Prison Discipline . . .", p. 239.

69 The account of these events is based mainly on that given by Barry, *op. cit.* Barry's biography of Maconochie is a careful and objective study and provides a full account of the latter part of Maconochie's career. For this reason the present paper makes only brief reference to his work as a penal reformer. For a bibliography of Maconochie's writings see Barry, *op. cit.*

70 Maconochie's writings attracted wide interest amongst those concerned in prison reform. For example one contemporary writer stated that "to Captain Alexander Maconochie is owing more than to any other individual living, the rational and humane system of prison discipline, which, though very slowly, yet surely, is extending itself through our land." (Hill, *op. cit.*, p. 213.) Dickens introduced a modification of the Marks System in his Home for Fallen Women. (See Johnson, E. (Ed.) 'Letters from Charles Dickens to Angela Burdett-Coutts,' London, 1953, and Collins, P. A. W., "Dickens as a Social Worker," *Social Work*, October 1958.)

71 See Barry, *op. cit.*; K. Maconochie, *op. cit.*, S. C. McCulloch, "Sir George Gipps and Captain Alexander Maconochie: The Attempted Penal Reforms at Norfolk Island, 1840–44." 'Historical Studies Australia and New Zealand,' Vol. 7, May 1957, pp. 387–405.

72 Glueck, S., in Barry, *op. cit.*, p. xii.

INVESTIGATIONS INTO THE SOILS AND AGRICULTURE OF THE MIDDLE DIYĀLÁ REGION OF EASTERN IRAQ

C. W. MITCHELL AND P. E. NAYLOR

IN A FORMER PAPER[7] on the Lower Diyālá region, reference was made to the Iraq Development Board's schemes for the development of the whole Diyālá basin. These schemes aim to improve the standard of living of the local inhabitants by expanding and intensifying agriculture with irrigation water from the new Derbendi-Khan dam. Two other sub-regions are affected: the Upper Diyālá and Middle Diyālá. After brief mention of the former, this paper considers the latter with particular reference to its main soil and agricultural problems and summarizes proposals which have been made for their solution.

The Upper Diyālá area lies between Derbendi-Khan and the gorge near the village of Kalar (see map). It is hilly country with little flat land suitable for irrigation from the Diyālá or its tributary streams. It was investigated in 1957–8 by Hunting Technical Services Limited, working for Sir Murdoch MacDonald and Partners, the Development Board's consulting engineers, to advise on measures required for erosion control and for the improvement of agriculture. It is primarily a stock raising area with a spring flush of grass used by nomadic herds of sheep and goats which winter to the south and spend the summer in the high mountains to the north. It has a small resident population precariously dependent on rain-fed agriculture but, as the area is generally unsuitable for irrigated farming, they will not benefit from the Development Board's expenditure on irrigation development, except for one or two very small schemes involving use of water from tributaries of the Diyālá.

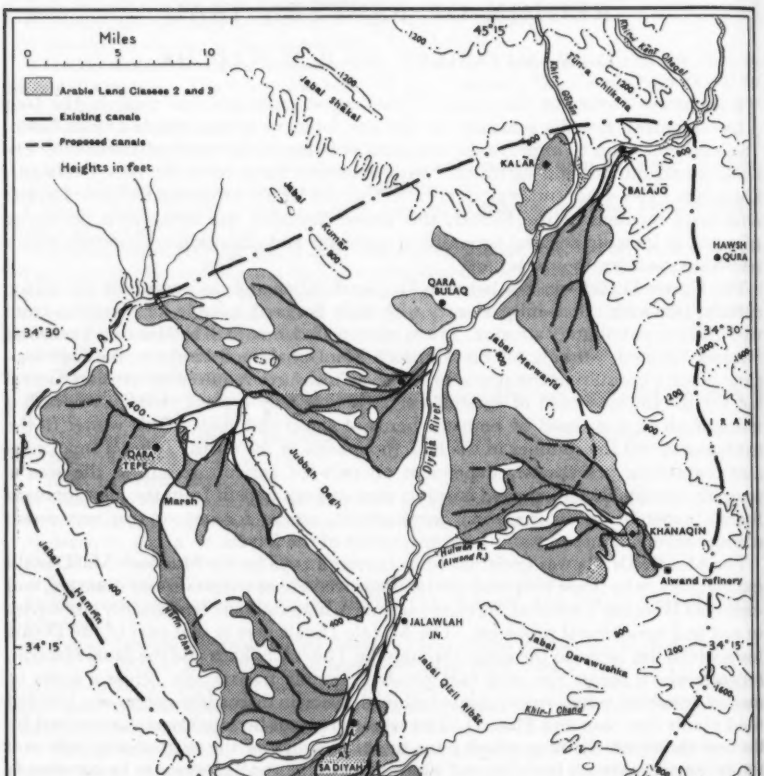
The Middle Diyālá was investigated in 1957 and 1958 by Sir Murdoch MacDonald and Partners, who made proposals for the improvement of irrigation and drainage, and employed Hunting Technical Services Limited to map soils and land quality and advise on soil and agricultural problems. The Middle Diyālá area is that part of the Diyālá basin which lies between the gorge through the Tūn-a Chilkana and the Jabal Hamrin, between which points the river falls 509 feet, cutting transversely across a series of parallel anticlinal ridges and elongated alluvial basins in discordant gorges and braided flood plains (see map and Plate 1). The whole area can be roughly circumscribed by the line shown on the map which joins the high points of the surrounding hills and marks the approximate limit beyond which the tributary valleys cease to be commandable from a dam at Balajo. The total area thus comprised is very approximately 900,000 acres, of which less than 30 per cent. is the "lowland" which forms the main agricultural land of the region.

Soils.—The valley soils are composed of very similar material to that in the Lower Diyālá area. Their parent material is transported from the soft calcareous fringing uplands, composed of Bakhtiari silts, clays and gravels overlying Fars marls and sandstones, and is interstratified in lower places with material brought by rivers and canals. It appears possible that in the past some local sedimentation may have taken place behind the Jabal Hamrin from impounded Diyālá flood water, but more recently a lowering of the base level in its gorge has rejuvenated all the upstream area. This has caused the largest wadis to be incised to a depth of as much as 30 feet and has left raised terraces beside the river, which are particularly important in the Upper Diyālá where they are used for the cultivation of rain-fed crops.

Typically, the valley alluvium is a stoneless "silty clay loam"[12] containing about 30 per cent. calcium carbonate and a small amount of gypsum. The hot climate and absence of leguminous crops combine to make nitrogen and organic matter content low. Available phosphorus is also somewhat low, but potassium appears to be

adequate. The soils are in general moderately fertile, but would probably benefit from nitrogenous and phosphorous fertilizers.

The most conspicuous limitations to soil fertility are high salinity and poor structure, both of which are caused by the action of soil water derived from rain and irrigation.



Canals and land classes in Middle Diyālá area, Iraq

Rainfall in Middle Diyālá is appreciably higher than in Lower Diyālá and increases towards the hills from about 10 inches at Jalawlah to about 13 inches at Khanaqin. Its effect on the valley soils is increased by the topography since the hill run-off, which is frequently torrential, collects in the plains, causes erosion and flooding, and adds to the effect of the large amount of irrigation water from the Diyālá and Hulwān rivers in moving salt through the soil and damaging the structure. Little information

exists on subsoil drainage, but it is sufficiently rapid to prevent high water-tables in all but a few small areas where uneven topography hinders run-off. Salinization by evaporation of trapped salty water takes place in such areas and is particularly notable around the large salt marsh south of Qara Tepe.

Table I, however, shows that the surface 5 feet of soil of the class 2, 3 and 6 land in Middle Diyālá is somewhat less saline than that in Lower Diyālá.

TABLE I

Salinities in Lower Diyālá and Middle Diyālá

	Approx. percentage of salts in soil material	*Percentage of area*		
		Non-saline	*Moderately saline*	*Highly saline*
Lower Diyālá	0·34	64	20	16
Middle Diyālá	0·1	86	10	4

On "basin" sites fine textured soils undergo a degradation of structure which in most extreme form gives rise to the characteristic hummocky, channelled micro-relief known as *gilgai* (Plate 2). It is accompanied by greater hardness, more intense cracking when dry, and slightly higher bulk density of the soil, and is responsible for some reduction in yields of crops. The most extreme *gilgai* areas are well suited for rice cultivation, but other crops are rarely grown on them. A smaller proportion of the land surveyed in Middle Diyālá has undergone structural degradation than in Lower Diyālá, 29 per cent. of the area being classified as poorly structured and 4 per cent. very badly structured in Middle Diyālá, as against 37 per cent. and 14 per cent. respectively in Lower Diyālá.

*History.**—Historically, the area is closely linked with the Lower Diyālá, but has suffered even more from its borderland position between Persia and Mesopotamia, witnessing the passage of many conquerors. Just to list the most outstanding of them illustrates the long and troubled history of the area. After the Gutians (*c.* 2150 B.C.) came the Kassites (*c.* 1600 B.C.), Elamites (*c.* 1200 B.C.), Assyrians (eighth century B.C.), Persians under Cyrus (537 B.C.), Moslems (A.D. 637) and finally the Mongols under Hulagu Khan around A.D. 1258, who left the region in the state it largely remained in until the present century. The surviving ancient canal lines, water control works and bridges date mainly from the Sassanian and Abbasid periods between 537 B.C. and A.D. 1258 and testify to the prosperity the region once enjoyed.

Population.—The total population of the area was estimated to be about 86,000 in 1957.[9] 26,000 live in towns of over 2000 persons, and three-quarters of these are in Khanaqin where there is an oil refinery. Of the remaining 60,000 it is estimated that over 16,000 are actively employed in agriculture. This latter figure, however, dates from the 1952–3 Agricultural Census and is thus not strictly comparable. Even those not actively engaged probably contribute some share towards the communal effort at some stage during the year, such as gathering scrub or dung for fuel, picking cotton, or cleaning out irrigation canals. The population is thus predominantly rural and agriculture provides the main source of livelihood.

Rural incomes are extremely low. The agricultural output of the area is estimated to be worth £1,185,000. This gives an average annual income of £70 per agricultural worker or of £20 per head of the rural population. This is less than half the average national *per capita* income of about £50.

Land Tenure.—Most land is held on indefinite leases from the Government known as *miri tapu* and *miri lazma*, which give rights of usufruct, disposal and inheritance. Holdings in the rain-fed lands are generally larger than in the irrigated areas and are sublet to share-cropping tenants who provide their own seed and implements. In the rainlands the farmer's share of the crop increases with the unreliability of the rainfall,

* Derived from information provided by Prof. T. Jacobsen of Chicago University.

but has hitherto usually been six-sevenths. In the land irrigated from the River Hulwān, the farmer's share is almost two-thirds, while in the areas irrigated from the Diyālá, it is about four-fifths of the winter, and one half of the summer crops. One of the worst features of this share-cropping system is the insecurity of tenure, which destroys the tenant's incentive to make lasting improvements to his land.

Under the Agrarian Reform Law of 1958 all private holdings in irrigated land are to be reduced to 620 acres, and in rainlands to 1240 by compulsory Government purchase. The expropriated land is to be resold to tenants in plots of 36 acres in irrigated, or 72 in rain-fed, land; though it can be distributed in smaller holdings down to 18 acres if it is thought desirable. The new law also lays down rules for dividing the crops on the remaining large holdings.

Irrigation.—The average rainfall of 10–13 inches is concentrated into the winter months and is sufficient in normal years to grow a crop of wheat or barley. It is, however, very variable and, in almost one year out of two, insufficient to produce a reasonable crop. In these years, and every summer, irrigation is essential, and it always makes possible increases in crop yields.

The rivers are highly seasonal, being abundant in winter but so reduced in summer that less than 3 per cent. of the total area can be irrigated. Water is diverted by means of temporary stone and brushwood dams, which have to be rebuilt every spring and are washed away by the first high flood of the winter. Irrigation, therefore, in summer is reliable and controlled although water is scarce, but in winter is erratic. The dams usually remain in place long enough to give an initial irrigation to the winter crops but these must depend on rainfall for their final maturing, whose unreliability frequently causes crop failures.

There are forty-four canals taking off from the Diyālá and seven from the Hulwān with total capacities of 533 and 155 cusecs* respectively. These capacities are only realized for short periods and the canals are insufficient to irrigate the whole commandable area even at times of greatest flow and are liable to breakage and heavy silting during the storms and flash floods common in winter and spring.

Agriculture.—The same agricultural pattern is found as elsewhere in lowland Iraq. Winter wheat and barley alternate with winter fallow, while only small areas of summer crops can be grown because of the shortage of irrigation water. Less than half the area is cultivated in any one year and of this rather less than half is irrigated. Crop production varies considerably from year to year, although even in an average year yields are extremely low. Barley averages about 7·9 cwt per acre and wheat about 5·8 cwt, compared with U.K. yields of 21·5 and 22·8 cwt per acre respectively [1]; yet as shown in Table II, opposite, these two crops together account on average for two-thirds of the total agricultural income.

The summer crops, including fruit, are more valuable in relation to their area than the winter ones, accounting for some 17 per cent. of the total value of output but only 4 per cent. of the cultivated area. Cotton is not widely grown because it must be planted in the spring, before the diversion structures on the rivers have been rebuilt and therefore before an assured supply of irrigation water is available. The area therefore lacks any widely cultivated, valuable cash crop and 40 per cent. of all produce is home consumed.

Most of the animals are raised by nomads on rough hill pastures, and although they are partly grazed on marshes and rice and cereal stubbles, livestock husbandry is not integrated into the agricultural rotation of the lowlands.

Soil and land classification.—The soil and land classification survey was the basis on which proposals for improvements were made. Essentially the same classes were mapped as in the Lower Diyālá, but differences in topography and the character of subsoils imposed certain modifications. The basic sub-divisions are according to texture, structure and salinity, which were the most agriculturally significant differences. Coarse textured soils are those which are dominantly loam, sandy loam, sand, loamy sand or coarse silt loam (under 20 per cent. clay) on the U.S.D.A. textural

* Cubic feet per second; 1 cusec will irrigate approximately 50 acres.

JABAL KUMAR RIDGE

Oblique view up Diyālá valley from Jabal Hamrin

Hunting Surveys, Ltd., May 1956

Hunting Surveys, Ltd., Sept.

Typical area in Middle Diyālá: Qara Tepe and neighbourhood

TABLE II

Crops of Middle Diyālá

Winter	*Rain-fed acres*	*Irrigated acres*	*Production tons*	*Approx. home consumed* %	*Total output value thousands (£ sterling)*
Wheat	52,700	49,600	30,000	33	607
Barley	34,100	26,000	24,000	50	189
Other (*a*)	none	1,200	—	40	15
Summer					
Rice	none	2,800	3,000–3,500	30	90
Cotton	none	200	50	none	3
Vegetables (*b*)	none	600	—	>50	20
Other (*c*)	none	300	—	80	10
Perennial					
Fruit (*d*)	none	2,700	—	77	86
Livestock (*e*)	none	—	—	50	123
Approx. Average	– – – – – – –			42	*Total* 1,185

(*a*) Includes beans, linseed, lentils, onions

(*b*) Includes tomatoes, aubergines, "ladies fingers," melons, cucumbers, squash, onions, beans, pulses

(*c*) Includes sesame, maize, greengram

(*d*) Includes dates, citrus, pomegranates, figs, mulberries, grapes

(*e*) 1952–3 figures—mostly sheep, but includes cattle and goats

triangle.[12] Fine-textured soils are those which are dominantly clay, silty clay, clay loam, silty clay loam or heavy silt loam (over 20 per cent. clay). Coarse-textured soils were considered to be slightly superior in being more permeable and easily drained. The sub-classes of the main series due to coarse-textured substrata which were recognized in the Lower Diyālá were not sufficiently common to be separated in this area.

As before, three salinity classes were recognized, low, medium and high, reflecting approximate salt percentages of 0–0·35, 0·35–0·65 and over 0·65, which represent salinity levels respectively highly, moderately and non-inhibiting to normal crop growth.

All the fine-textured soils were also graded according to their degree of approach to *gilgai* characteristics into those with satisfactory, poor or bad structure for agricultural use.

Middle Diyālá is much more hilly than Lower Diyālá and shallow soils overlying gypsum or gravel beds were sometimes found, particularly round the margin of the hills. These were given new soil names and assigned to land class 3 or 6 according to the degree of limitation imposed by topography and shallowness.

The same three land classes were used as in the Lower Diyālá area, *viz.* nos. 2, 3 and 6 of the U.S.D.I. Bureau of Reclamation classification.[13] Class 2 is land of "moderate suitability for irrigation farming, being measurably lower than class 1 in productive capacity, adapted to a somewhat narrower range of crops, more expensive to prepare for irrigation and more costly to farm." Class 3 comprises lands that are "suitable for irrigation development, but are appoaching marginality for irrigation and are of distinctly restricted suitability because of more extreme deficiencies in the soil, drainage and topographic characteristics than for class 2 lands." Class 6 lands are those "considered non-arable . . . because of failure to meet the minimum requirements for the other classes of land." Any land with either high salinity or bad structure was put into class 6, and with either medium salinity or poor structure into class 3 while only land with neither of these limitations was put into class 2.

The hills and their fringing "sloping gravelly lands" were added to the miscellaneous land classes (tels, old canal lines, town and village sites, orchards, gullies and river-wash lands) which were considered to be outside the scope of the survey.

The lowland area in Middle Diyālá is divided among the main land classes as follows:

TABLE III

Areas of land classes in Middle Diyālá

	Acres
Class 2 land	92,000
Class 3 land	102,600
Class 6 land	26,700
Orchards	2,600
Miscellaneous	25,600
Total	249,500

The class 2 and class 3 lands are shown on the map and together comprise approximately 195,000 acres. Of these about 135,000 are commandable from existing canals, and the remaining 60,000 presently depend on rainfall. Furthermore, in the hills, there are more than 100,000 acres of poor, scattered, rain-fed, arable land (see map, p. 470).

The future.—It should be evident from the preceding description that any considerable increase in farming output, and hence in the standard of living of the area, must depend on two main lines of improvement: first, supplying the good land with an increased and assured supply of irrigation water throughout the year and, secondly, developing agriculture by adopting a more intensive farming rotation and by improving farming methods.

The most urgent requirement is the replacement of the seasonal stone and brushwood dams by headworks on the Diyālá for all existing canals to eliminate the reliance on an uncertain rainfall for the ripening of the winter crops. This is made doubly important by the construction of the Derbendi-Khan dam, whose valuable stored water would otherwise go to waste down the canals and waterlog the whole area.

The other main engineering proposals concern the enlarging and remodelling of the canalization system (see map) in order to permit full agricultural development of the existing irrigated area and to bring irrigation water to about 21,000 acres of new land. The total capacity of existing canals is 688 cusecs; new canals will increase this to the 1130 cusecs required for full development. 66,000 acres of new land will be affected by the implementation of the Land Reform Law of 1958, and when this area is sub-divided into small holdings further detailed proposals for the remodelling of the minor canalization will be needed. It is furthermore proposed to drain the marsh area south of Qara Tepe, to reserve land for other drains and to build flood protection banks at Khanaqin, Jalawlah and Sa'diyah.

The proposals for the improvement of farm output assume that the assured regulated water supplies, which will become available on the completion of the Derbendi-Khan dam, will allow the output of winter crops to be stabilized and that of summer crops to be substantially increased. It is recommended that the intensification of the farming system be brought about by replacing part of the winter fallow area by a legume which will fertilize and improve the structure of the soil and encourage the adoption of a mixed farming system with livestock husbandry integrated into the cropping rotation. This could be brought about with no change in the amount of wheat and barley grown. It is hoped that the proportion of summer crops will increase from about 3 per cent. of the area at present, to 25 per cent. as a first stage, and possibly up to 33 per cent. The main crop recommended for the summer is cotton, which will benefit largely from the early spring planting made possible by the new permanent diversion structures. The cultivation of sugar beet may also prove feasible. It has grown well under experimental conditions in the north of Iraq and is a highly remunerative crop. If it proved possible to grow it both in winter and summer, the area could produce up to 25,000

tons of sugar a year. Considerable areas of fodders to balance the winter legume, and of vegetables, are recommended as additional summer crops.

This increase in the intensity of the farming system must be balanced by improvements in farming practices if it is to yield its full benefit in increased output. Apart from shortage of water, the most important factors at present responsible for low crop yields are probably poor land preparation, low seed rates and low soil fertility. With more attention paid to these and with improved seed varieties, better weeding and land drainage, it is hoped that yields can be considerably increased in a short period. As in the Lower Diyālá, these various improvements would lead to a considerable increase in output, even without any additional water, if they could be explained to the cultivators through a more efficient agricultural extension service than exists at present. But it is the combined result of all these measures that is needed to produce a major increase of output. If they can all be combined into an effective programme of development it is expected that the annual agricultural income of the region will increase from the present £1·2 million up to about £3 million, without any substantial change in the labour force. This would mean that the income of the individual cultivator, given a more even distribution of incomes as a result of land reform, would be tripled, and a holding of 36 acres would be capable of producing an annual income, after paying farm expenses, of about £300 for the cultivator and his family.

Acknowledgement.—Our thanks are due to the Director General of Irrigation of the Iraq Government and to Sir Murdoch MacDonald & Partners for permission to publish the information contained in this paper, which was derived from studies done for them on the Diyālá–Middle Tigris Projects. We wish to thank our employers, Hunting Technical Services Ltd., and also Hunting Surveys Ltd., for the facilities they granted us for preparing the paper and for providing the photographs.

More specifically, we wish to thank Mr. V. C. Robertson, Dr. T. N. Jewitt and Dr. R. Smith, and all our colleagues of Hunting Technical Services Ltd., without whose work this could not have been written, and all the other British and Iraqi staff of the Company whose work we have drawn on.

REFERENCES

[1] Food and Agriculture Organization of the United Nations, 1958, 'Production.' Yearbook of Food and Agriculture Statistics, 1957, Vol. 11, Part 1, Rome.

[2] Harris, S. A., 1958. "The *gilgaied* and bad-structured soils of Central Iraq." *J. Soil Sci.*, 9, 2.

[3] Ionides, M. G., 1937. 'The regime of the Rivers Euphrates and Tigris,' E. & F. Spon, London.

[4] MacDonald, Sir Murdoch, and Partners, 1958. "Lower Diyālá development: Soils, irrigation, agriculture and drainage." Report No. 2: Diyālá and Middle Tigris Projects. Government of Iraq Development Board.

[5] MacDonald, Sir Murdoch, and Partners, 1958. "Upper Diyālá development: conservation and agriculture." Diyālá and Middle Tigris Projects. Government of Iraq Development Board by Hunting Technical Services Ltd.

[6] MacDonald, Sir Murdoch, and Partners, 1959. Report No. 4: "Middle Diyālá development." Diyālá and Middle Tigris Projects, 1st Technical Section. Republic of Iraq Development Board, General Report; Appendix I "Irrigation and drainage"; and Appendix II "Soils and agriculture" by Hunting Technical Services Ltd.

[7] Mitchell, C. W., 1959. "Investigations into the soils and agriculture of the Lower Diyālá area of eastern Iraq." *Geogr. J.*, **125**, 3.

[8] Naval Intelligence Division, 1944. 'Iraq and the Persian Gulf.' Geographical Handbook Series B.R. 524.

[9] Republic of Iraq, Ministry of Economics, 1958. 'Statistical Abstract 1957,' Baghdad.

[10] Republic of Iraq, Sovereignty Council, 1958. *Agricultural Reform Law, No. 30*, Baghdad.

[11] Smith, R., and V. C. Robertson, 1956. "A classification of the saline soils of the old irrigation lands of the Middle Tigris Valley." Sixth International Congress Soil Science, D.693–8.

[12] United States Department of Agriculture, 1951. 'Soil Survey Manual.' Handbook No. 18. Soil Survey Staff, Bureau of Plant Industry, Soils and Agricultural Engineering, Superintendent of Documents. Government Printing Office, Washington, D.C.

[13] United States Department of the Interior, 1951. Bureau of Reclamation Manual, Vol. 5. 'Irrigated land use,' Denver, Colorado.

THE ORIGIN AND HISTORY OF CENTRAL-ANDEAN RELIEF: DIVERGENT VIEWS

SIR CHARLES COTTON

CONTRASTING OPINIONS as to the origin of the relief of the Andes and the history of its development have been expressed in recently published papers by Dresch (1957; 1958) and Garner (1959). There are notable divergences (1) in the date assigned to the uplift which has given the range its altitude and has initiated the sculpture of its existing relief, the question being whether this was the upheaval that accompanied the development of folding of the strata composing the range or one that has taken place subsequently to an erosional planation of the folded structures; and (2) in the origin assigned to abundant superficial deposits carrying fertile soils in valleys at high altitudes on the mountains and the date of their emplacement.

Garner (1959, p. 1347), who adopts a one-cycle theory of Andean relief, refers as follows to the hypothesis of a widespread planation followed by renewed upheaval and dissection: "It has heretofore been necessary to elevate the surface from near sea level. . . . An uplift in excess of 12,000 feet is postulated . . . in 'relatively recent' times. . . . Such an assumption is based on the premises that (1) the uplifted surface is the product of peneplanation, and (2) the degree of incision of mountain valleys is the amount of and in response to tectonic uplift alone." With both of these he disagrees. The experienced geomorphologist Dresch (1957; 1958), on the other hand, whose studies of the Andes are unfortunately not cited by Garner, finds no fault with the theory that great and sensibly uniform upheaval has taken place at a comparatively late date, affecting a vast area with a surface of small relief that truncates strata deformed by mid-Tertiary folding. As collateral evidence in support of the upheaval which he and others before him have inferred from the morphology of the range he has cited the discovery in Peru of Pliocene beaches—with a fauna "comparable to that of the present day"—at altitudes up to 3000 or 3500 metres, and he has remarked on the similarity of floras west and east of the central Andes, which would seem not to have been long in existence as a barrier to plant migration. The fish, moreover, in Lake Titicaca (altitude 3804 metres)—notably a sea-horse (*Hippocampus*)—can have entered its waters only when, in the Pliocene, it was at sea level.

Dresch (1958, p. 148) notes, however, that it is not merely by normal rejuvenation that elevation to a high altitude has brought about the dissection of the Andes; but rather has valley erosion been controlled by the introduction of "new morphoclimatic conditions" produced by lowering of temperature consequent on upheaval, to which have been added the effects of Pleistocene refrigerations. In the glacial ages, while summits and valley-heads were extensively glaciated, periglacial processes were very active down to much lower levels over a vast area. Thus upper valleys are now infilled not only with fluvioglacial gravels, as has been supposed in the past, but also with abundant periglacial debris (Dresch, 1958, p. 149).

Dresch regards the development of the high Andean surface of planation, the Puna, above which there are some residual mountain masses, as due to erosion when the land was at a low level in the Upper Miocene (1958, p. 145), the surface being shortly afterwards gently upheaved and parts of it maturely or post-maturely redissected; while in the Pliocene and Pleistocene (p. 147) it was much more strongly upheaved so as to initiate the mountain and valley sculpture which is now in progress.

Dresch (1957, p. 14) remarks on the contrast between the flat surfaces of surviving remnants of the Puna and the steep sides of residual mountains that rise above them. This contrast of slopes might be claimed as evidence of arid pediplanation, of savanna planation, or even of cryoplanation of the Puna surface. It gives thus limited support to the contention of Garner (1959, p. 1347) that the so-called peneplain has been cut by pedimentation; but Garner further claims that this pediplanation, restricted to arid

episodes, was not controlled by base levels near to or related to sea level* but took place at high altitudes, not everywhere the same. Further, he attributes the incision of deep valleys in the mountain mass to "humidity acting on existing relief rather than tectonic uplift alone" (p. 1347). This is tantamount to a claim that such of the peaks and plateaus of the Andes as are non-volcanic owe their altitude solely or in great part to an upheaval as old as—*i.e.* accompanying—the last (mid-Tertiary) folding. Thus Garner definitely rejects the geomorphic and other evidence that has formerly been relied on as proof of more recent uplift of the Andes.

Dresch (1957, p. 6; 1958, p. 149) has found evidence in high-altitude basins and valleys of the Andes of a dominant periglacial regime that has been but recently interrupted. This was characterized by freeze-and-thaw weathering accompanied by extensive solifluction, with some development of periglacial land forms. It is thus indicated that the last glacial age, and in general the colder ages of the Pleistocene, have been times when much soliflual debris has accumulated on the sides and floors of high Andean valleys, whereas the deepening of valleys must have gone on more vigorously in the interglacial ages. The main dissection of the mountain mass by valley cutting would seem, therefore, to have taken place in the warmer ages of the Pleistocene and to have been slowed down or halted and even locally reversed in the glacial ages. Such an alternation seems to be normal; it is not necessary to assume that it is peculiar to the Andes. Thus Eschman (1958), who has studied terraces of the North Platte River, Wyoming, comes to the conclusion that, while the river flowed at grade and cut laterally during glacial episodes, which were "periods of relatively humid, cool climate," the flood plains so developed were later incised and thus converted into rock-cut terraces "during interstadial times when the climate was more like the semi-arid climate of today."

Garner (1959, pp. 1339–49), who has studied the eastern slopes of the Andes Mountains in Peru, draws attention to the accumulation in the valleys of abundant "alluvial" debris. "All observers . . . have remarked on the coarseness of the alluvial deposits. . . . The general size and angularity . . . is an indication of normal talus accumulations" (p. 1341). Garner claims that the coarse, angular valley fill accumulated not during but prior to the last glaciation. According to his theory, Pleistocene valley deepenings, accompanied by dissection and partial or complete evacuation of previously accumulated valley fills, have taken place in the pluvial ages that have been contemporaneous with glaciations.

The upper valleys are U-shaped, a form which Garner (p. 1349) attributes to excavation by glacier tongues in an episode of rather severe glaciation, perhaps in the penultimate glacial age, while lower valleys, presumably cut contemporaneously by rivers, are V-shaped. Though narrow-floored and gorge-like at lower levels, the valleys at high altitudes are thus wide and open. ("The Urubamba Valley is 2½ miles wide at 12,000 feet.") These wide valleys contain an enormous amount of fill. Although the valley fill is now suffering erosion, its dissection and removal are not far advanced (Garner, Figs. 9 and 10, captions). It is trenched by the main rivers to a depth of 200 feet or more, but the rivers have not generally cut through it down to bedrock (Garner, p. 1341). This is the fill which other writers have attributed to accumulation in glacial

* In support of his theory of high-altitude arid planation of the Puna surface, Garner (p. 1347) cites L. C. King's 1953 definition of pediplanation, in which the relation of pediplane development to a base level is not stressed as strongly as it is throughout the second edition of that author's 'South African scenery' (1951). That Professor King has not changed his opinion regarding strict control of levelling of the land surface by base level is shown, however, by the following statement which he has made at the writer's request: "Re base level, I have never abandoned this concept, which places a limit upon downward erosion either by running water or by mass movement, and if it does not appear stated in my own work that is just because I have accepted the concept and have not seen any reason to discuss it further, understanding that there are two kinds, local and general" (*in litt.*, 19 January 1960). It is true, of course, that King's whole concept of major cycles of planation presupposes control by the general base level, this being not merely a limit on downward erosion but a level which a surface planed by erosion must approach.

ages, those quoted by Garner describing it as for the most part fluvioglacial, while Dresch (1958, p. 149) recognizes both valley-side periglacial accumulations and those due to aggradation of valley floors with gravel supplied to rivers by solifluction.

Garner (p. 1349) pictures an indeterminable number of earlier infillings followed by evacuation of the debris as valleys have been deepened and widened by erosion. He attributes most of the fill that remains in the valleys to accumulation in the interglacial age that followed the principal recognizable episode of valley excavation—presumably in the last interglacial age, which he assumes to have been arid. He describes the emplacement of the fill as confluent and overlapping fans fringing the valley sides.

Under the humid climate of today accumulation of further fan material is quite negligible (p. 1344), and the relict fans, which contain a large proportion of coarse debris, have become weathered and soil-covered. It was mainly these lower side slopes of the valleys, consisting superficially, according to Garner, of fertile soil recently developed over fan debris, that were terraced and cultivated in Inca times.

Garner (pp. 1347–8) claims correlation between the supply of coarse angular waste that has accumulated in the valleys and a high-level pediplanation of the highland plateau (the Puna), which would take place at times when "scarp retreat would be associated with aridity" (p. 1349).

Just as relatively humid conditions prevail now on the eastern slope of the Andes of Peru while the western slope is arid, so, according to Garner (pp. 1362–3), have arid and humid climates alternated in the Pleistocene on each side of the range. On the western slope he attributes excavation of valleys to river work in former humid ages and finds evidence of alternating phases of humid dissection and of accumulation of debris under arid conditions like those of the present day; but each such event is one phase earlier than on the eastern side of the range, so as to make it seem that throughout the period of Pleistocene climatic oscillation there has been at every stage a contrast of arid and humid climates on opposite sides. Garner suggests correlation of the rhythm with changes in the temperature of the Humboldt Current related to the waxing and waning of Antarctic glaciation. Coldness of the current would cause a diminution of the rainfall on the western slope—more specifically on the upper part of that slope—but this would occur contemporaneously with glaciation at high altitudes and humidity in the lower valleys on the eastern side of the range.

Whether the periglacial or the arid theory of origin of Andean valley fills is to be preferred, it is regrettable that Garner has not discussed the possibility of their periglacial origin. Apart from the merits of the competing periglacial theory, however, there are difficulties in the way of acceptance of the arid theory. While arid erosion of Puna benches would, if it took place, apparently supply coarse angular waste to valleys at lower levels, it would seem doubtful whether, even if extreme aridity be admitted, planation on the required scale could take place without some base-level control.

If the interglacial climates have been arid, and if a general similarity of postglacial and interglacial climates may be assumed, it would also be natural to expect an arid climate at the present day in the eastern Andes, with arid accumulation now in progress. The argument that major accumulation ceased at the end of the last interglacial age is further weakened by the fact, which Garner (p. 1341) notes, that little of the valley fill has as yet been removed by erosion, though he admits, and indeed asserts (p. 1349), that "prolongation of present humid conditions" would result in its complete evacuation.

BIBLIOGRAPHY

Dresch, Jean, 1957. "Les types de relief morphoclimatiques et leurs limites dans les Andes centrales." *Bull. Ass. Géogr. franc.* 263–4, pp. 2–19.

Dresch, Jean, 1958. "Problèmes morphologiques des Andes centrales." *Ann. Géogr.* **67**, pp. 130–51.

Eschman, D. F., 1958. "Role of climatic change in the formation of paired rock-cut terraces" (abstract). *Bull. geol. Soc. Amer.* **69**, pp. 1561–2.

Garner, H. F., 1959. "Stratigraphic-sedimentary significance of contemporary climate and relief in four regions of the Andes Mountains." *Bull. geol. Soc. Amer.*, **70**, pp. 1326–68.

MAP OF ASHBOURNE, DERBYSHIRE

E. M. YATES

THERE ARE PRESERVED in the Public Record Office a number of early large-scale maps that are of considerable importance to the historical geographer. Many were originally drawn to form part of the evidence submitted in disputes over land. For a number of these maps it is possible to trace the associated evidence heard by the court, and these records increase their potential geographical value.

The Ashbourne map (M.P.C. 35) appears to have been used in a dispute over enclosure of common pasture, and the hearing took place in 1547 (D.L. 3/49/C1).

Construction.—The map shows a strip of country 2½ miles to 3 miles long (from east to west), extending from Ashbourne to the Kniveton Brook. In its length the scale of the map is reasonably consistent. A larger scale was used for the width in order to exaggerate the lane, for the lane was the common in dispute. The width of the lane is given in paces, and the method of survey was probably pacing and field sketching. The sketching was sufficiently accurate to facilitate the identification of fields on the present 6-inch sheets (SK.14 N.E. and SK.24 N.W.) or on the ground. The common arable field can easily be traced since the present field pattern shows strips in the same direction as those indicated on the map.

The dispute.—The lane had been common of pasture for the people of Ashbourne. Mathew Knyeton (Knyeton in the written evidence, Kynstone on the map) had enclosed. The hedges (with gates and ladder stiles across the lane) are shown, and the enclosed parts of the lane are distinguished from the farm land on either side by being "nether ryge nor reane." The case was brought by Sir Thomas Cockeyne, Christopher Hurte and William Jackson, all of whom held land along the Ashbourne end of the lane. As was then the practice, sworn evidence was collected from a number of local people who had known the lane and local custom over a long period. The majority of these witnesses agreed that the lane was common at its Ashbourne end, but differed about the extent of the area subject to commoning. One witness, John Aley, said that a previous attempt had been made to enclose the lane, but the hedge had been pulled down by the Ashbourne people. Mathew Knyeton had now re-erected the hedge, and drove off any cattle from Ashbourne. In the process the boy who looked after the town herd had been beaten by Knyeton's men and he, the witness, "did meet the boy running and wepying." Christopher Greenwood, the oldest witness, aged 87, claimed to have known the area for sixty years and stated that the common rights only extended as far as the brook. As well as the Kniveton Brook there is a brook marked on the map, rising near "northe" and crossing the lane near to Sir Humphrey Bradburne's house.

Knyeton appears to have been an aggressive landowner for he was later involved in a further dispute over rights of common (D.L.I./23/F4). He was charged by a number of other Ashbourne farmers with not allowing common of grazing across some of his fields, although this right had been enjoyed for years. The grazing was for cows in summer; for sheep, horses and cows in winter. The fields in this later dispute must therefore have been enclosed from pasture and not from arable.

Points of interest

1. The map shows Ashbourne as a small town with a triangular market place. This shape of market was widely used, for it is present at St. Albans, Ashford, Bicester and Market Drayton. The Ashbourne market in 1547 was in process of being built up. The booths in the market place had been replaced with permanent buildings, but there are noticeable differences between this huddle of houses in the centre of the market and

the more regularly placed houses on either side of the street. Some trace of this regular pattern of houses still exists on the west side of the market, with wood-framed buildings projecting back from the street. The site of the first building on the left beyond the church is now occupied by the old grammar school. The school was built in 1586, thus providing additional verification of the early date of the map.

2. The regular layout of the houses and the triangular market suggest a deliberate development. In Domesday, Ashbourne was a waste manor with a recorded population of a priest, two villeins and two bordars. By the reign of Edward I Ashbourne was a town and the town status is confirmed by a reference to sixteen burgages in the possessions of Francis Cockeyne (son of Sir Thomas Cocken or Cockeyne named on the map) at the time of his death (E/130/749/13). Ashbourne is, therefore, likely to be an example of the large class of small non-walled market towns founded or developed in the twelfth and thirteenth centuries. The church provides further evidence: the original foundation was Saxon, but the oldest part of the present church, one of the largest in Derbyshire, dates from the early thirteenth century. The church was rededicated in 1241.

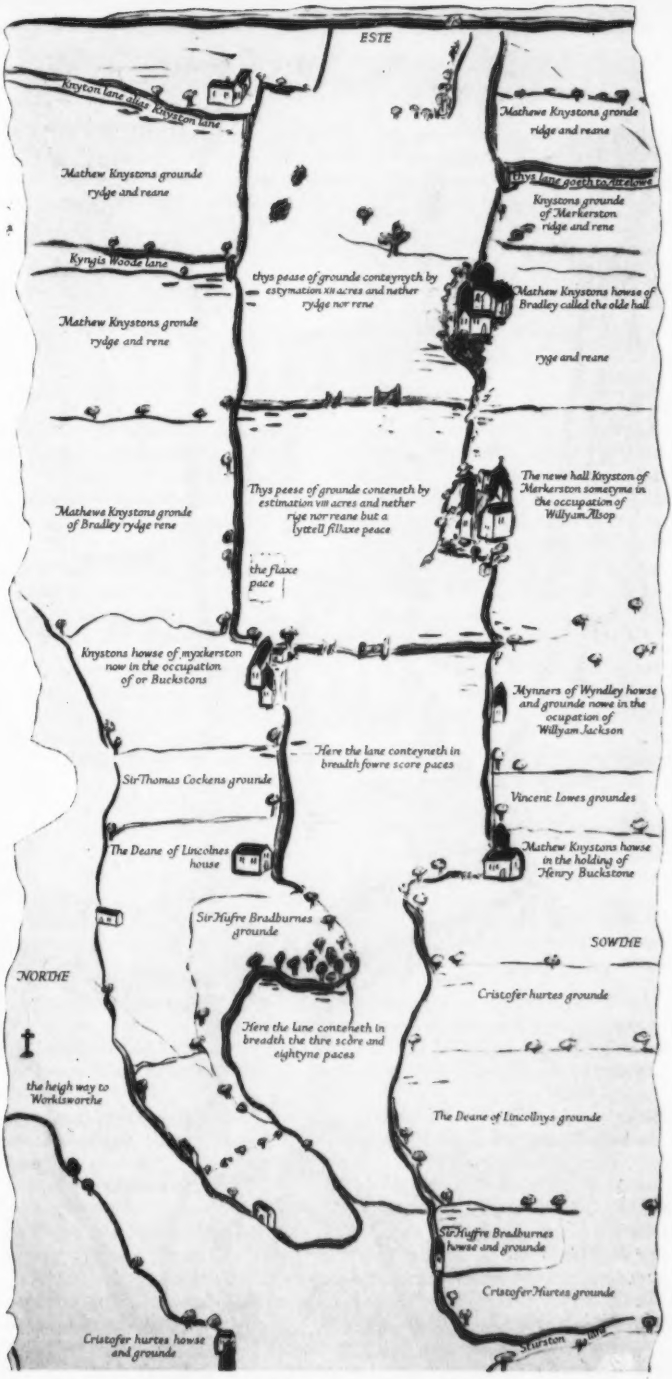
3. Such small towns were not, of course, entirely concerned with trade. Farming was still important. The open arable field, Neighmere field, is shown on the map, and the dispute itself shows an active interest in farming. In a previous dispute Jackson and Cockeyne had contested the ownership of two swathes of meadow land (D.L. 3/22/J2). It would be interesting to know whether the manufacturing towns of the period had a comparable interest in farming.

4. The most intriguing feature of the map is the presence of a large number of small hedged fields and isolated homesteads. The New Hall and the Old Hall are minor "seats" but the other isolated homesteads appear to be cottages or farms. A number of these have disappeared, illustrating once more the many changes in settlement distribution that have taken place in England. Ashbourne rectory was among the possessions of Lincoln Cathedral until 1560 (B.M. ADD MS. 6671), and this accounts for the presence of the Dean of Lincoln's house. The house is not shown as leased to a tenant, and may therefore have been a country house, occasionally occupied by the Dean. It, too, has vanished.

Many of the small hedged fields are marked "ridge and reane." This term means ridge and furrow. The fields, therefore, were or had been arable. The problem then arises:—how had these small fields come into being? The most obvious explanation is "Tudor enclosure." The date of the map is 1547, however, and the memory of Christopher Greenwood would carry us back almost to the beginning of the Tudor period. If these fields had been enclosed from open arable field during the period, it would surely have been mentioned during the hearing of the dispute, as most relevant evidence. If these fields are indeed enclosures from a large open field, they are pre-Tudor. On the other hand, the form of the lane, with widenings into "greens," does not resemble that of an access road across an open field. It appears to be a feature of considerable antiquity, even older than the Neighmere field, for the latter was probably laid out when Ashbourne was developed as a town. The "se" in Segrovefield and the "mere" in Neighmere are both referring to pools, and Ashbourne is a non-habitative place-name, so that the land near Ashbourne is likely to have been neither the first farmed nor the first settled. Enclosure from a large open field is therefore an unlikely origin for these small hedged fields.

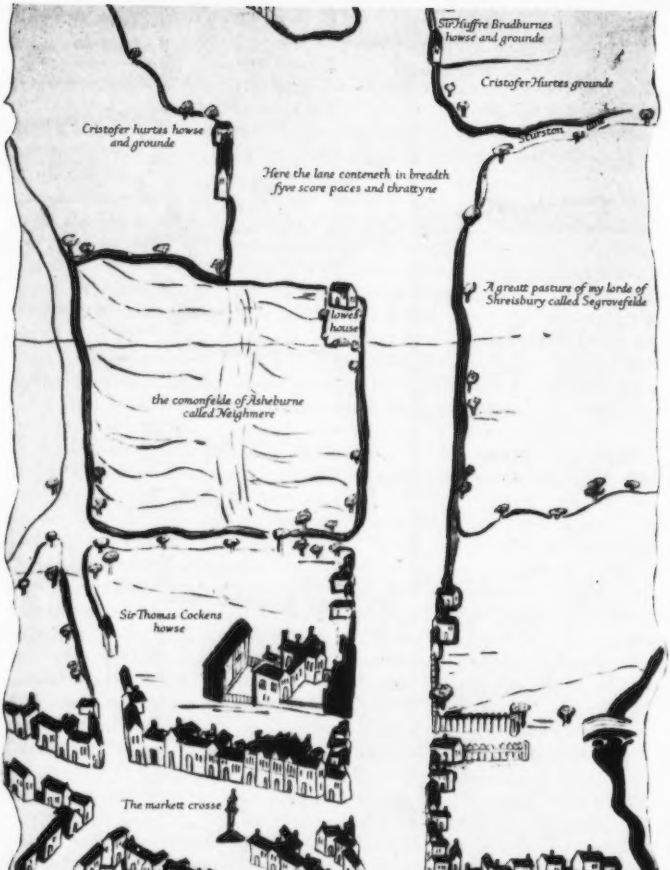
A second explanation of this combination of small size with ridge and furrow would be the use of ridge and furrow for drainage purposes. It is difficult to accept this as an explanation since the land is far from flat.

The third explanation is that this is a true example of small fields which had been divided into strips. The difficulty is now partly with nomenclature. The study of the wide range of field patterns associated with communal farming has been rather neglected in this country (apart from the bald distinction between open and enclosed), consequently, small hedged common fields sounds almost a contradiction in terms. Nevertheless the former presence of such fields has been recognized in various parts of


ESTE
Knyton lane alias Knyston lane
Mathew Knystons grounde ridge and reane
Mathew Knystons grounde rydge and reane
thys lane goeth to Ashborne
Knystons grounde of Merkerston ridge and rene
Kyngis Woode lane
thys pease of grounde conteynyth by estymation xii acres and nether rydge nor rene
Mathew Knystons howse of Bradley called the olde hall
Mathew Knystons grounde rydge and rene
rygge and reane
The newe hall Knyston of Merkerston sometyme in the occupation of Willyam Alsop
Thys peese of grounde conteneth by estimation viii acres and nether rige nor reane but a lyttell fillaxe peace
Mathewe Knystons grounde of Bradley rydge rene
the flaxe pace
Knystons howse of myckerston now in the occupation of or Buckstons
Mynners of Wyndley howse and grounde nowe in the occupation of Willyam Jackson
Here the lane conteyneth in breadth fowre score paces
Sir Thomas Cockens grounde
Vincent Lowes groundes
The Deane of Lincolnes house
Mathew Knystons howse in the holding of Henry Buckstone
Sir Hufre Bradburnes grounde
SOWDHE
NORDHE
Cristofer hurtes grounde
Here the lane conteneth in breadth the thre score and eightyne paces
the heigh way to Worksworthe
The Deane of Lincollnys grounde
Sir Hufre Bradburnes howse and grounde
Cristofer Hurtes grounde
Cristofer hurtes howse and grounde
Sturston

Map of Ashbourne, redrawn from unpublished Crown copyright material in the Public Record Office. Reproduced by permission of the Controller, Her Majesty's Stationery Office

[continued overleaf


Sir Huffre Bradburnes howse and grounde
Cristofer Hurtes grounde
Cristofer hurtes howse and grounde
Hurston lane
Here the lane conteneth in breadth fyve score paces and thrattyne
A greatt pasture of my lorde of Shreisbury called Segrovefelde
lowell house
the comonfelde of Asheburne called Neighmere
Sir Thomas Cockens howse
The markett crosse
Digge streatt crosse
Asheburne Towne
Gidfrey Wellye
John Harvour
John Paller
Asheburne Churche
WESTE
J.A.C. del.

England. The field pattern eastward of the Ashbourne map is possibly of greater age than the three-field system. Maps of this kind are, therefore, likely to be of great value in considering the application of the extremely interesting German investigations of the development of rural settlement forms and farming systems to this country. Studied together with the wealth of documents normally available and with the ground, they should make possible a major contribution by English geographers to the same theme.

THE KULU–LAHUL–SPITI WATERSHED

J. P. O'F. LYNAM

THE MAP ACCOMPANYING this article is based on the plane-table and photographic surveys of a small party led by J. G. G. Stephenson which visited Spiti in 1958. We went to Spiti for three reasons: it is relatively easy of access, being less than a week's march from roadhead at Manali in Kulu; it is not affected by the monsoon (we could only go in July and August); and the large errors in the Survey of India map sheet 52H had been discovered, but only partly remedied by previous expeditions. The party's route is shown on the map; it was chosen to cover as much new ground as possible, and to resolve the discrepancies in the existing maps of the Bara Shigri. The area mapped is roughly that of the Survey of India Sheet 52H S.E.

When the expedition visited the area in 1958 the following maps existed:

1. S. of I. Quarter-inch Sheet 52H. North of Kulu this map is based on nineteenth century exploratory surveys, which are accurate so far as the main valleys are concerned. The side valleys were only sketched in—the Ratang, Gyundi and Bara Shigri with more imagination than accuracy.

2. A. E. Gunther's sketch-map in *Geogr. J.* **121** (1955) p. 117. This was an attempt to reconcile Sheet 52H with the Bara Shigri as Gunther and Kempe found it. Their estimate of the length of the glacier was 15 miles.

3. The Abinger expedition map of the Bara Shigri glacier, based on a plane-table survey. Two rather different versions exist, one published by Mrs. Dunsheath in the *Himalayan Journal* **20** (1957) p. 106, and the other by Miss F. Delany in 'The Mountain World' 1958/9, p. 153.

4. P. F. Holme's map in *Alpine Journal* **61**, 294 (1956) p. 458 (also on a smaller scale in *Himalayan Journal* **20** (1957) p. 86). This map is based on photographic surveys of two expeditions—1955 and 1956.

All these maps have contributed something to the present one. In addition, I have used photographs taken by Gunther, Holmes and the Abinger party, photographs taken by K. E. Berrill during his attempt on Peak 31/52H in 1952, and panoramas and photographs by McArthur (see *Alpine Journal* **61**, 293 (1956) p. 279) taken in the Kunzum area.

The main survey was carried out with a plane-table, and heights were determined by Indian clinometer. As we worked off the Survey of India framework there was no need for any baseline nor, consequently, for any linear measurement.

The Survey of India station, Shilataker, 17,244 feet, north-east of the Kunzum Pass, was occupied to start the survey. Thereafter, since it usually proved impossible to locate stations in advance, they were plotted by resection from previous stations or from Survey of India stations or intersected points (such as Peak 32/52H, 20,550 feet in Lahul, which was frequently visible). Unfortunately, as we got farther south lack of time prevented our setting up as many stations as we would have wished. The survey closed without appreciable error at the peaks of the Kulu/Bara Shigri divide. The plane-table work was supplemented by photographic panoramas which were accurately levelled and direction-fixed by a special tripod head. Panoramas were taken from all plane-table stations and from several other points. The photographs have been used

to plot the bearings and inclinations of many minor points on which plane-table sights were not taken.

The map

A. The Dongrimo valley is plotted entirely by plane-table. We investigated Peak 31/52H (20,570 feet) which Holmes had thought to be only 19,500 feet, and found a prominent peak at the right location of the right height, which had been previously identified as Peak 20,570 feet by Berrill. Homes had found a peak of about the right height some 2 miles north. We were able to identify this and to compute its height at 20,413 feet. The name Dongrimo for this valley was given to us by the headman at Losar. It referred both to the stream and to the pasturage on the west side. The east side he called Ganmo.

B. The triangle Losar–Kunzum–Peak 20,570 feet was sketched from a photographic station at 17,880 feet. From here the peak climbed by Holmes in 1955 and given a height of 18,500 feet, was seen. We also saw the peak climbed by McArthur in 1955 and shown on his map as 18,050 (or 18,100) feet. We agree with this height and assume that Holmes was mistaken in his identification of this peak, which he thought only 17,600 feet high; there is a 17,600 foot peak a little to the west.

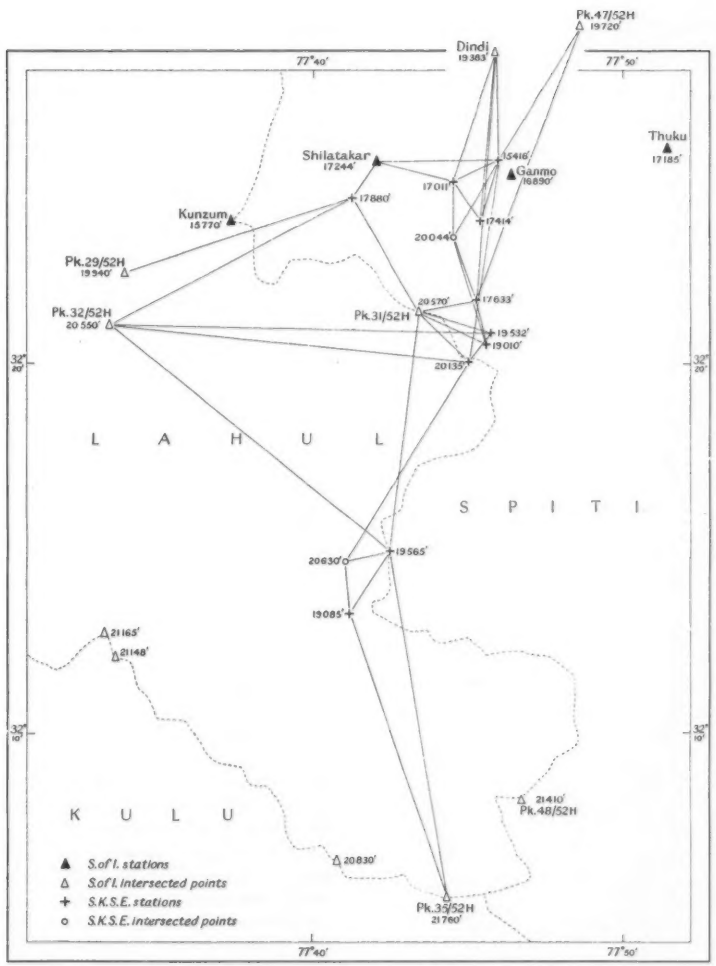
C. The main Gyundi valley was plotted from plane-table stations but most of the detail is from photographs. The west wall as shown on Holmes's map seems to be about one mile too far to the east.

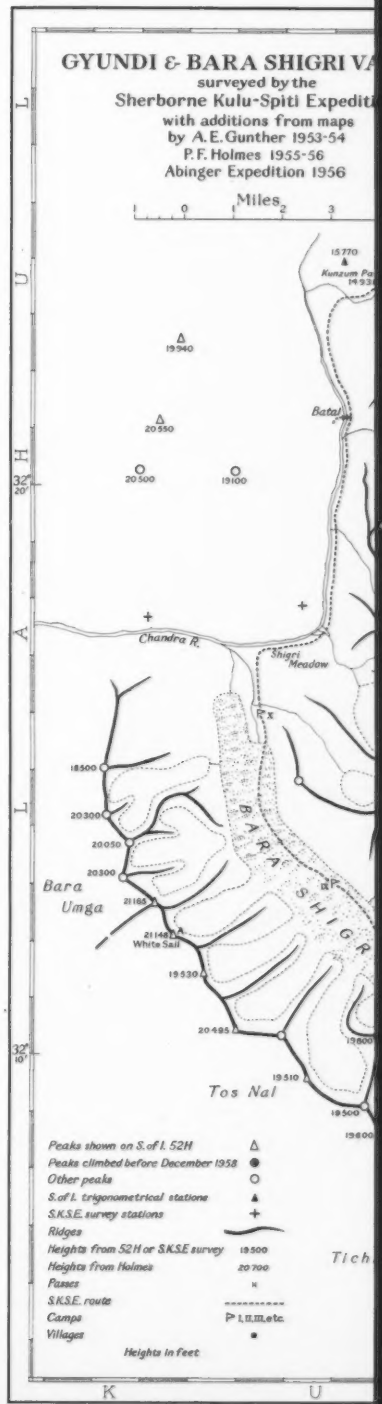
D. When we reached the head of the Gyundi we impinged on previous surveys. As far as the length of the Bara Shigri is concerned, our survey agrees with Holmes's—there was no difficulty in recognizing the peaks plotted by him, dominated by the Peak 48/52H to which he had given a height of 22,500 feet. We think it higher than the survey height, but only by 300 feet. We have also reduced the height of "Gunther and Kempe, 1953 Bara Shigri Peak" to 20,700 feet; Holmes's heights are based largely on long sights to Guan Nelda, 20,680 feet, on the other side of the Spiti river, on which he has made no allowance for earth curvature; such allowance would reduce all his heights in the Upper Ratang by 300 feet or so. In the delineation of the Bara Shigri we have agreed almost entirely with the Abinger map as reproduced in 'The Mountain World' (see p. 153, para. 3).* Comparison of photographs taken from many angles of the south wall of the glacier has sorted out the mass of peaks into order and enabled identification from the north of the intersected points marked on Sheet 52H. At the lower end of the Bara Shigri there seem to be five large peaks, not four as mapped by Holmes. From most view-points one of the five is hidden, which may account for its being overlooked. The heights of the three not shown on Sheet 52H seem to be only about 20,000 feet; this confirms J. O. M. Roberts's view.

E. North of the Bara Shigri the general shape of the new map varies but little from Holmes's, but we have moved the whole group around the Lion and Central Peak about one mile south-west. These adjustments have tended to lengthen the Kharcha. Unfortunately, we have no data of our own to plot the Kharcha, and the present map has been compiled by an elastic use of Holmes's map coupled with a study of Gunther's panorama from "Gunther and Kempe Kharcha 19,150 Peak" and McArthur's panorama and photographs from Peak 18,050 (or 18,100) feet. Our divergences in height from Holmes's map are considerable here. He shows a peak of 19,100 feet immediately to the east of the 19,000-foot peak he climbed east of the main Kharcha glacier. We calculated this peak to be 20,000 feet; the peak Holmes climbed was unfortunately hidden, but cannot be very much lower. In the absence of any other information we have retained his height on the new map.

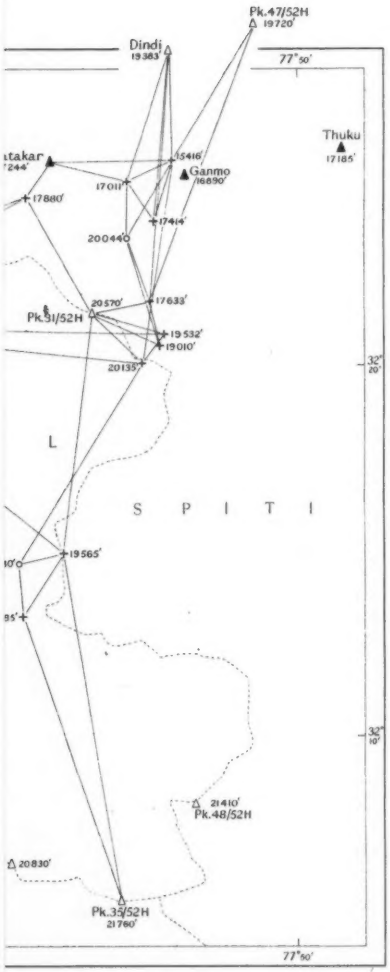
Acknowledgement.—The Expedition is greatly indebted to the Royal Geographical Society for the loan of survey equipment.

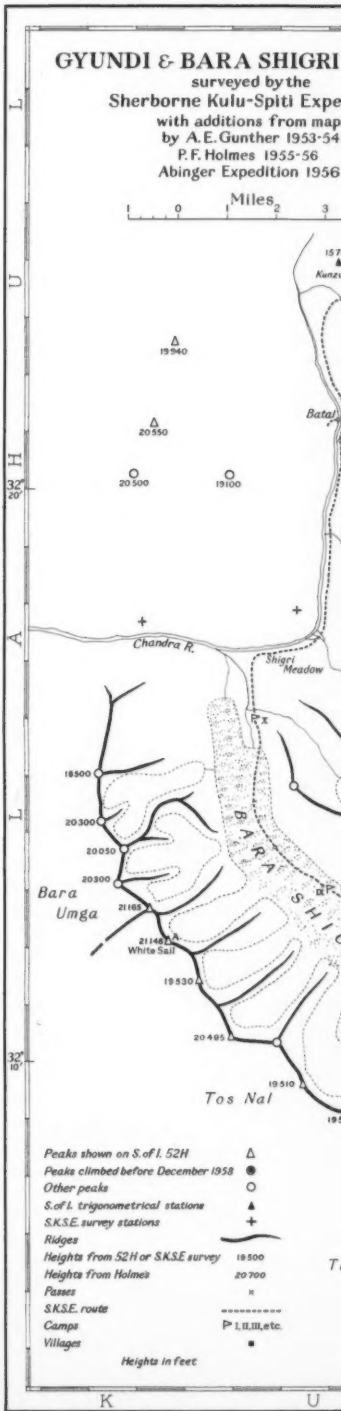
* The right-hand peak in the photograph by J. O. M. Roberts in the *Alpine Journal* 53, 265 (1942) p. 328, "19,000–20,000 ft. peaks at head of Tos Glacier, from E. Glacier Col. Camp," is almost certainly Mrs. Dunsheath's "Tiger Tooth" above Concordia, with the south slope of the Ice Pass falling to 4 o'clock from it: see Joyce Dunsheath, 'Mountains and memsahibs,' Constable, London 1958.



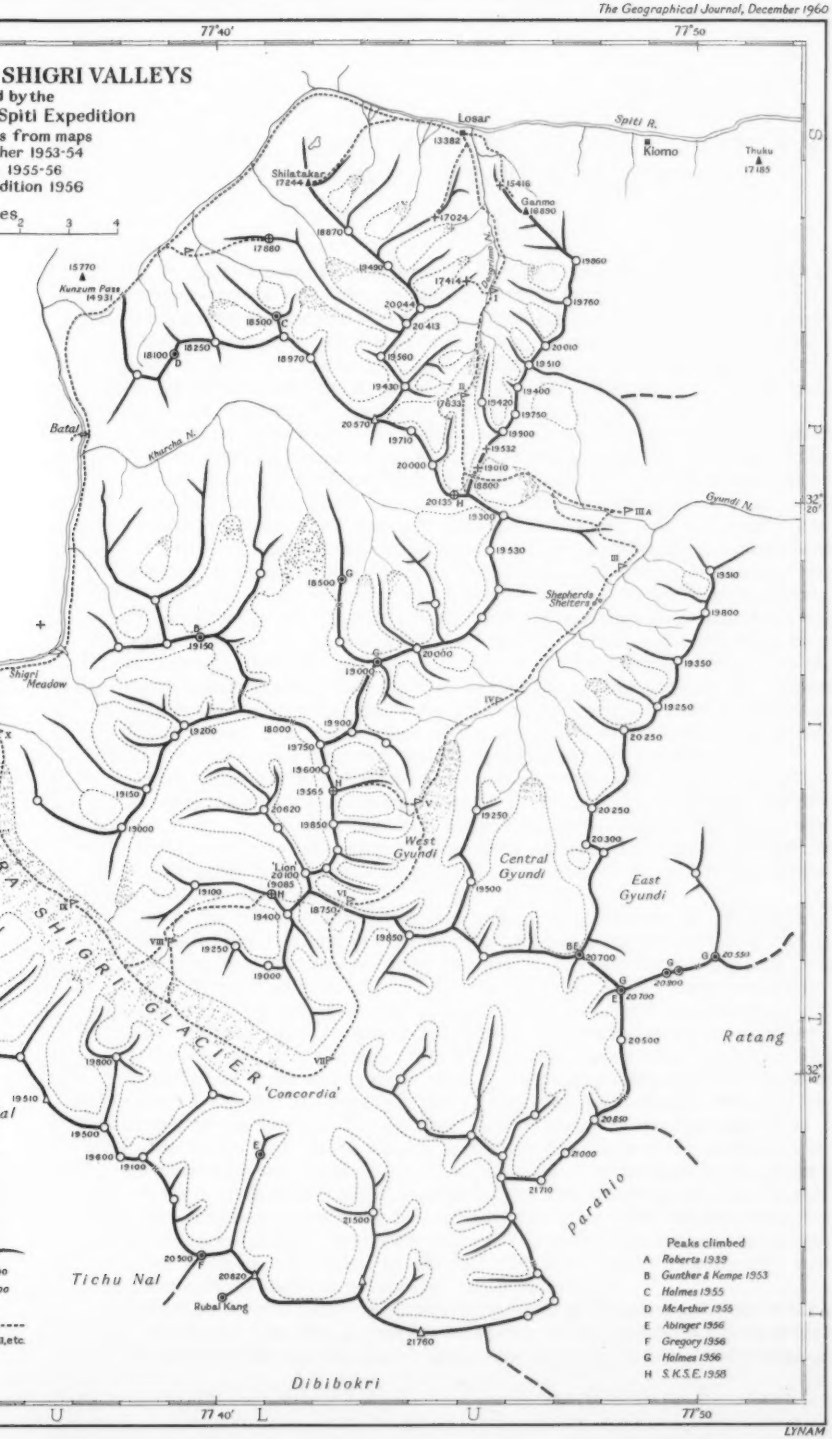


Published by the Royal Geographical Society





Published by the Royal Geographical Society


77°40'
77°50
SHIGRI VALLEYS
by the
Spiti Expedition
s from maps
her 1953-54
1955-56
dition 1956
Losar
Spiti R.
Kiomo
Thuku
17185
Shilatakar
17244
Ganmo
19890
Kunzum Pass
14931
Batal
Kharcha N.
Gyundi N.
Shepherds Shelters
Shigri Meadow
West Gyundi
Central Gyundi
East Gyundi
Lion
Ratang
SHIGRI GLACIER
'Concordia'
Tichu Nal
Rubal Kang
Parahio
Dibibokri
Peaks climbed
A Roberts 1939
B Gunther & Kempe 1953
C Holmes 1955
D McArthur 1955
E Abinger 1956
F Gregory 1956
G Holmes 1956
H S.K.S.E. 1958
77°40'
77°50
LYNAM

GLACIAL MELTWATER CHANNELS IN THE UPPER TWEED DRAINAGE BASIN

R. J. PRICE

IN THIS PAPER a description is given of, and explanations suggested for, some of the erosional features carved by the meltwaters of the last ice to occupy the upper Tweed basin. The complex pattern of 180 channels that has been mapped cannot be explained as a series of overflows from ice-dammed lakes, for reasons that are stated below. An attempt is made to explain the origin of these channels in the light of the fuller appreciation of the processes involved in the dissipation of ice, and the resulting erosion by meltwaters, that has been obtained in recent years.

Following publications by Mannerfelt (1945, 1949) and Hoppe (1950), re-examination of features resulting from meltwater erosion has taken place in the United Kingdom and North America. Publications by Sissons (1958*a*, *b*, *c*) have dealt with meltwater channels in parts of southern Scotland and Northumberland, and work carried out in the vicinity of Knob Lake, Labrador (Derbyshire, 1959), deals specifically with the use of air photographs in the identification and interpretation of meltwater channels. In the areas dealt with in these papers, the evidence which suggests that the channels referred to were cut by streams of meltwater flowing along the ice margin or in tunnels in or under the ice, rather than by overflows from ice-dammed lakes, seems convincing. Sissons points out that (1958*c*, p. 182), "Abundant evidence has now been accumulated, however, both on present-day retreating glaciers (Charlesworth, 1957) and in formerly glaciated areas, showing that, except for calving glaciers, the wastage of glaciers is essentially by thinning and only to an insignificant extent by back-wastage at the terminus." This implies that the ridges and hills emerge above the ice surface during wastage, the ice remaining longest in the valleys and lowlands.

The meltwater channels that have been mapped on the side of the Tweed valley and its tributary the Kingledoors valley constitute the only extensive evidence of meltwater erosion in the upper Tweed basin (*i.e.* south of the Biggar Gap). The pattern that has emerged from the mapping of the 180 channels discussed below presents many problems relating to their mode of origin and the manner of the dissipation of the last ice in this area (see Fig. 1).

Most of the hills in the area form elongated ridges between the tributary valleys, their rounded tops reaching altitudes of between 1300 and 1700 feet. They are formed of Ordovician and Silurian greywackes and shales. Between Drumelzier and Tweedsmuir the Tweed has a flood-plain bounded by very steep slopes formed by the glacially over-steepened ends of spurs, the crests of which are between 700 and 1000 feet above the valley floor. South of Tweedsmuir the valley takes on a much more open form and the rise to the higher ground is achieved much more gradually. This is particularly true of the south-eastern slope of the ridge that separates the Kingledoors and Tweed valleys. The northern end of this ridge rises steeply from the Tweed valley but to the south of Tweedsmuir many of the spurs rise quite gently to 1300 feet, after which they have a steeper profile. To the south of the confluence of the Kingledoors Burn and the River Tweed, the short left-bank tributaries are in great contrast to the long right-bank tributaries such as the Talla and Fruid Waters, and this has produced contrasts between the two sides of the valley. The left side consists of a series of spurs separated by shallow valleys. The correlation between topographical contrasts in different parts and on different sides of the upper Tweed valley and the distribution of the meltwater channels, is discussed below.

There is no detailed published work on any aspect of the geomorphology of the area here considered. The drift boundaries are shown on the Geological Survey maps and the boundaries of the sand and gravel deposits were transferred from these maps to the

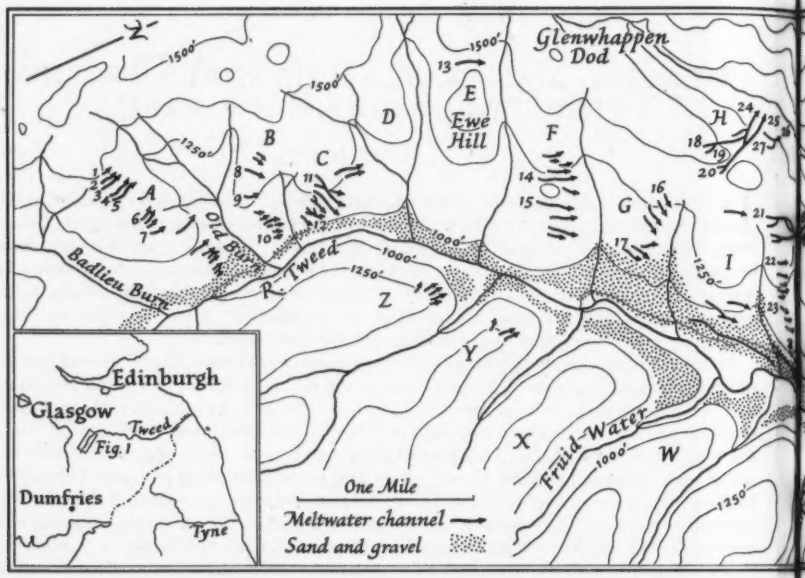
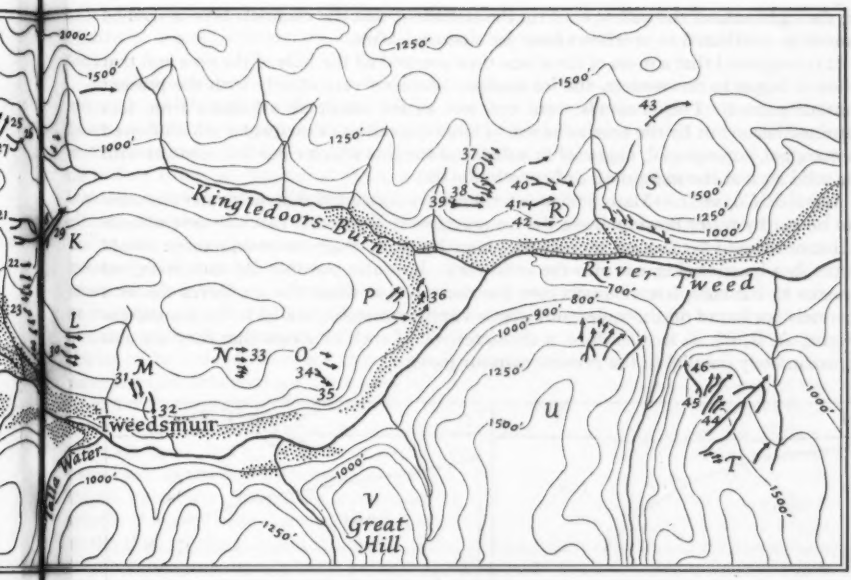


Fig. 1. Meltwater channels in the upper Tweed basin. The highest point on an up-and-down thereafter is 250 feet. Sand and gravel are modi

Ordnance Survey Six-Inch sheets. Similarly, information obtained from examining, with a stereoscope, vertical aerial photographs on a scale of 1:10,000 was indicated on the Six-Inch sheets, which were then taken into the field, where numerous additions and corrections were made.

There is great variety in the size and form of the channels in this area. Many are from 50–200 yards long and from 10–30 feet deep. They have steep sides and the ones with flat peat floors usually have gentle gradients. The larger ones are several hundred yards long and up to 100 feet deep. Channels 5, 14, 30 and 41 have a sinuous form, whereas most of the other channels are straight or slightly curved. Channel 41 is very impressive; it is sinuous and has a V-shaped cross profile that is 50 yards wide at the top and 100 feet deep. In contrast to these very large channels there are features which, owing to their smallness and indistinct form, are not indicated in Fig. 1, but which could have resulted from erosion by meltwaters.

The few channels that have suffered very little infilling by mass wastage or by growth of peat have a V-shaped cross profile and an irregular long profile (*e.g.* 24, 28, 29, 38, 41). A few channels have a definite up-down long profile cut in rock (*e.g.* 39, 41). There appears to be no constant relationship between the size of a channel and its position on a spur. Some spurs have the largest channels near the top (*e.g.* spur J), while others have them at their lower ends (*e.g.* spurs Q and R). There is considerable variety in the position of the channels in relation to the spurs into which they have been cut. Some have been cut parallel to the contours of the spur (*e.g.* 5, 7, 37, 42), while others have been cut through the crest of a spur and usually at right angles to the line of the crest (*e.g.* 8, 13, 14, 22, 39). Yet others have been cut at a considerable angle to the contour lines on only one side of a spur (*e.g.* 11–12, 16–17, 31–32). In a few instances the major watershed between the River Tweed and the Kingledoors Burn has been breached by channels (*e.g.* 18, 19, 20, 28, 29). Numerous channels occur on the over-steepened spur ends on the right side of the valley.



down channel is indicated by a bar. The contour interval is 100 feet up to 1000 feet and modified after the Geological Survey of Great Britain

There is a marked concentration of channels on the left side of the valley: 150 out of the 180 indicated on the map. In the distribution and position of these channels there occurs a repeated pattern. There are five groups: spurs A, B, C; F, G, I; J, L, M; N, O, P; Q, R, S. In each of these groups the most southerly channels are aligned almost parallel to the trunk valley and are cut around or through the spurs; then each group is terminated by channels that are cut at an angle to the contour lines of the spur on which they occur. There are no channels on spurs D and E, and on the upper parts of I and M, and it is significant that the highest channel in any group is at a greater altitude than the lowest channel in the group immediately to the south. Most of the channels on the right side of the Tweed valley occur on the spur ends. Once again there is a grouping of channels—they occur on four spurs, two spurs in each group, while the other spurs are devoid of channels.

There are several reasons why the channels described above cannot be attributed to overflows from lakes occurring in the re-entrants and dammed up by ice occupying the Tweed valley. There is no evidence of shore-lines, deltas or lake floor deposits. The position and form of some of the channels and the absence of channels on certain spurs suggest that the origin of these channels will not be solved by postulating numerous ice-dammed lakes. If it is assumed that an ice-dammed lake would overflow at the lowest point on a col, how are channels 2, 3, 4, 5 and 14 to be explained? In the two cols in which these channels were cut, one would expect to find only one channel instead of the sequence of channels occurring on the side of the cols.

When water flows freely down a slope it usually follows the line of maximum slope. It should be noted that the channels on spur C (11–12) and spur G (16–17) are at an angle to the line of maximum slope and, therefore, cannot be attributed to the spill over the spur crests of waters from lakes that existed to the south. Other examples, such as the complex system on spur J (21–22) and the channels on the spur ends

on the right side of the valley, confirm the statement that the channels here described cannot be attributed to overflows from ice-dammed lakes.

It is suggested that a mass of ice at one time covered all the hills of the area and that when it began to downwaste, the ice margin coincided very closely with the present contour pattern. The channels were cut, not as the result of overflows from ice-dammed lakes, but by the erosive action of large quantities of meltwater which flowed in marginal, supraglacial, englacial or subglacial streams which came into contact with the solid rock at the margin of, or beneath, the ice.

Marginal Channels.—Many previous writers have suggested that meltwater channels can be cut by water flowing along the ice margin—it is possible that one side of such a channel would be formed by ice, the other by rock. Such an arrangement would result in a bench being cut into the solid rock. It is also possible for such marginal streams to cut complete channels into the rock so that when the ice leaves the area channels are found on the valley side aligned approximately parallel to the ice margin (Fig. 2, A, B, C). It is, therefore, a characteristic of such channels that they are also approximately parallel to the present contour pattern.

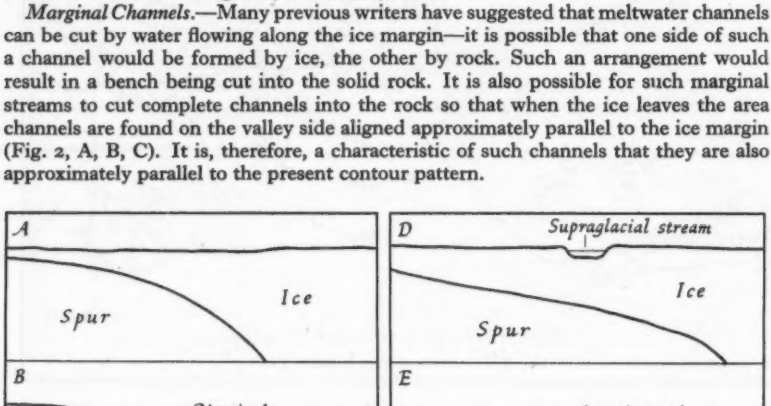


Fig. 2. Diagrammatic reconstruction of the development of marginal and superimposed meltwater channels. In parts C and F the slope of the ice surface is indicated by contours at intervals of 20 feet

The most southerly channels in the Tweed valley (1–6) are some of the highest in the area: 2–5 are from 15–40 feet deep and are the longest channels on the spur (up to 600 yards); 3 and 4 have flat peat floors that are 15 yards wide; 6 is not so large—210 yards long, 12–15 feet deep and has a flat peat floor, 12 yards wide. It appears that 1–5 are marginal channels cut along the side of a mass of ice that was downwasting in the depression between the two 1500 foot contours on spur A. The absence of channels along the side of the Badlieu valley indicates that the meltwater streams were flowing across the mass of ice occupying the valley rather than at the ice margin, and when their northward progress was interrupted by spur A they cut channels 1–7.

On spur B, 9–10 begin on the spur crest and run along the north-east facing slope of the spur. It is thought that they are marginal channels cut at successively lower levels as the ice downwasted. It is suggested that the absence of channels on the southern side of the spur is the result of the meltwaters flowing across rather than around the

lobe of ice that occupied the Old Burn valley. On spur N is another series of marginal channels. These features are between 10 and 40 yards wide and about 600 yards long.

Subglacial channels.—There is evidence of subglacial stream erosion in the form of channels which run straight down hillsides or at a considerable angle to the contour lines: 26, 27 and 34 are excellent examples of marginal channels which are terminated at their northern ends by "subglacial chutes" (Mannerfelt, 1945). Channels 18, 19, 20, 28 and 29 begin on the higher slopes of the Tweed valley and cut across the present watershed between the Tweed and the Kingledoors valleys, and their intakes fall in altitude from south to north. All the channels are V-shaped and vary in depth from 20–50 feet. It is difficult to estimate the amount of erosion done by the meltwaters because it is probable that the channels were cut in pre-existing cols at the head of small tributary valleys. Channels 18, 19 and 20 appear to have been marginal channels at the edge of the Tweed ice which became subglacial as they plunged beneath the ice occupying the Kingledoors valley. The complex systems at H and K indicate that the ice in the Tweed valley and that in the Kingledoors valley was at approximately the same level on either side of the watershed. There must have been ice up to around the 1500 foot contour in the Tweed valley for the upper parts of 18, 19 and 20 to have been cut; and to a similar level in the Kingledoors valley, since the continuations of those channels to 24 and 25 occur at an oblique angle to the contours and, therefore, must have been controlled by tunnels in the ice. Channels 28 and 29, separated by rock ridges, repeat the relationship to be found between the lower parts of 24 and 25. These double channels which carried the meltwaters from the Tweed valley descend almost to the floor of the Kingledoors valley and, if they were functioning throughout their length at any one time, tunnels permitting the flow of water beneath at least 300 feet of ice must have existed in the Kingledoors valley.

Most of the channels on the right side of the Tweed valley are subglacial chutes which occur on the spur ends. The complex system of channels on spur T indicates that there was ice at least up to the 1600 foot contour. All the channels are shallow: 5–15 feet deep and 5–15 yards wide. It appears that meltwaters were flowing across, and at the margin of, the ice that occupied the valley between spurs T and U. Channels 44–46 all begin as marginal forms and then plunge down the spur end. All the channels on spurs U, Y and Z are subglacial chutes which carried meltwaters over the spur ends and beneath the ice occupying the Tweed valley. These channels are attributed to glacial meltwaters rather than to post-glacial gullying because they have abrupt beginnings and endings and do not always go straight down a slope. They contain no streams at present and occur on only four of the spurs on the right side of the Tweed valley, whereas if they were the result of gullying it would be expected that similar channels would have been formed on the other spurs.

Superimposed channels.—Some channels (*e.g.* 8, 13, 14 and 22) cut through the crest of a spur rather than follow the contours around a spur as would be expected in a true marginal channel. It is suggested that such channels were formed by meltwater streams that were flowing on or in the ice and which were let down on to the spur beneath and cut into it (Fig. 2, D, E, F). It is not possible to describe them as marginal channels as they are quite likely to have occurred some distance from the ice margin, if the streams that cut them were flowing in supraglacial gorges, or subglacial or englacial tunnels. The manner in which these forms cut through the crests of the spurs suggests that their courses were primarily determined by the pre-existing ice valley. It is suggested that large meltwater streams, similar to those that occur in association with some present glaciers (*e.g.* Hagafellsjökull Eystri, central Iceland; Hoppe, 1950, p. 49), existed on and in the ice occupying the Tweed and Kingledoors valleys. As the ice surface downwasted, these ice valleys or tunnels were lowered and eventually came into contact with solid rock and superimposed their courses on to the spurs. This hypothesis explains why many of the channels in this area cut through the spurs and why they are of more or less constant width and of low gradient throughout their length. Thus the channels here described only represent a very small part of the

courses of the meltwater streams, the greater parts of which were either on or in the ice.

It is important that the form of the ice surface be considered as it is not possible to postulate supraglacial streams flowing on an ice surface which falls very rapidly from the centre of the valley to the valley side. There is probably a relationship between the angle of slope of the valley side, or spur, and the slope of the ice surface towards the lateral ice margin, based upon the amount of reflected heat received from a steep slope as against that received from a gentle slope. Many of the spurs on which, it is suggested, supraglacial streams superimposed their courses, have gentle gradients and the ice surface would not have had a steep slope. There appears to be no reason why englacial or subglacial, rather than supraglacial, streams could not have cut some of the channels in this area. Channels which have a sinuous course and up/down profiles (*e.g.* 36, 41) could be explained by the superimposition of meltwater streams flowing in or under the ice under hydrostatic pressure. It is also possible that, when a supraglacial stream was superimposed upon an underlying spur, it could have become englacial or subglacial on what was, in terms of the direction of the ice movement, the lee side of the spur. It is possible that the ice contact on the lee side of the spur may have had certain weaknesses and these would soon be utilized and enlarged by a meltwater stream. Evidence to support this hypothesis is to be found on several spurs in the area here considered. On spur B, channel 8 cuts through the spur but to the north the channels are all subglacial forms (11–12). The meltwaters which cut 8 either became subglacial at its northern end or somewhere on the lobe of ice between spurs B and C. If a channel has a gentle gradient as it cuts through a spur and then has a markedly steeper gradient, it is probable that the change in gradient represents the point at which the supraglacial or englacial stream became subglacial. Channel 40 starts as a bench, cuts through the spur crest and runs down the northern side of the spur, and it is suggested that after the supraglacial stream had cut through the spur it became subglacial on the northern side.

Conclusions.—There was a concentration of meltwater erosion on the left side of the Tweed valley and this may be related to the fact that the ice surface probably had a general slope from south-east to north-west in this area. It has been suggested by Young (1864) and Geikie (1877) that the source area of the ice which flowed down the Tweed valley was the high ground to the east and south—an arc stretching from Broad Law, through White Coomb and Hart Fell, to Great Hill.

The highest channels in the area occur at approximately 1600 feet, proving that ice covered the hills to at least that altitude. It is suggested that at one time there was an ice sheet covering the area, which began to downwaste. On the downwasting surface of this ice a complex meltwater drainage system developed that cut the channels here described when solid rock became a barrier to stream courses established on, in or under the ice, or at the ice margin.

The position of the thirty channels on the right side of the valley can also be related to the slope of the ice surface and the original movement of the ice from the south-east to the north-west. Nearly all the channels on the right side of the Tweed valley are subglacial chutes which carried meltwaters over the spur ends. It is suggested that meltwaters made use of the fissures which would be expected on the lee side of the spurs, and the subglacial chutes were cut.

The predominance of meltwater erosion on the left side of the Tweed valley can also be attributed to the fact that the topography there is more conducive to channel formation than it is on the right side. These spurs have a more gentle slope down to the Tweed valley than those on the right side and the valleys that separate them are comparatively shallow. The spurs separating the right bank tributaries descend very quickly some 250 feet to the floor of the Tweed valley.

Along the length of the Tweed valley on the left side there is a repetitive pattern in the distribution of channel types. There are five distinct groups of channels and in each group the channels are at first aligned almost parallel to the trunk valley and are the result of erosion by marginal, supraglacial, englacial or subglacial streams (spurs

A, B; F; J, L; N, O; Q, R). Each group is then terminated by a series of subglacial channels which carried the marginal or supraglacial streams beneath the ice (spurs C; G, I; M; P; R). There is no apparent reason for this repetitive pattern.

Owing to the doubt cast upon the marginal position of many of the meltwater channels in this area it is not possible to discuss with any certainty the angle of slope of the ice surface or the rate of downwastage as indicated by successive marginal channels.

At attempt has been made to suggest the origin of some very distinct channel forms in the upper Tweed basin. Certain characteristics of these channels are such that hypotheses suggested by other writers, to explain the origin of meltwater channels, have had to be modified and one new process suggested. There are many more meltwater channels in the Southern Uplands and when these have been mapped and examined, a clearer picture of the way in which the last ice dissipated, and the processes involved in meltwater erosion, should emerge.

Acknowledgements.—The author wishes to thank Dr. J. B. Sissons for reading the typescript of this paper and for valuable discussion. He also acknowledges the help he received from the staff of the Aerial Photographs Department, Department of Health for Scotland, Edinburgh.

BIBLIOGRAPHY

Charlesworth, J. K., 'The Quaternary Era.' 1957.

Derbyshire, E., "The identification and classification of glacial drainage channels from aerial photographs." *Geogr. Ann. Stockh.* **40** (1958) pp. 188–195.

Flint, R. F., "The stagnation and dissipation of the last ice sheet." *Geogr. Rev.* **19** (1929) pp. 256–89.

Flint, R. F., "The glacial geology of Connecticut." *Geol. and Nat. Hist. Survey, Conn. Bull.* 1930.

Geikie, A., 'The great Ice Age.' 1877.

Hoppe, G., "Några exempel på glacifluvial dränering från det inre Norrbotten." *Geogr. Ann. Stockh.* **32** (1950) pp. 37–59.

Mannerfelt, C. M., "Några glacialmorfologiska formelement." *Geogr. Ann. Stockh.* **27** (1945) pp. 1–239.

Mannerfelt, C. M., "Marginal drainage channels as indicators of the gradients of the Quaternary ice caps." *Geogr. Ann. Stockh.* **31** (1949) pp. 194–9.

Sissons, J. B., (*a*) "Sugblacial stream erosion in southern Northumberland." *Scot. geogr. Mag.* **3** (1958) pp. 163–4.

Sissons, J. B., (*b*) "The deglaciation of part of East Lothian." *Trans. Inst. Brit. Geogr.* **25** (1958).

Sissons, J. B., (*c*) "Supposed ice-dammed lakes in Britain with particular reference to the Eddleston valley, southern Scotland." *Geogr. Ann. Stockh.* **40** (1958) pp. 158–87.

Young, J., "On the former existence of glaciers in the high grounds of southern Scotland." *Quart. J. geol. Soc. Lond.* **20** (1864) pp. 452–62.

THE PROVISIONING OF MOUNTAINEERING EXPEDITIONS

J. D. KINLOCH AND E. J. E. MILLS

THE RATIONING of most other types of expedition is tending towards standardization, but there is still a wide variance of opinion and attitude on the subject of provisioning mountaineering expeditions. In the main, these opinions and attitudes have not been examined scientifically and the studies of food intake during expeditions have been of short duration and therefore inconclusive. An attempt is made in this paper to put on record some conclusions reached in two recent mountaineering expeditions. It has not proved possible to do more than summarize the findings of the 1956 Alaskan expedition; the rationing of the British Pakistani Forces Himalayan Expedition 1958 is described in full.

I. *Parachute Brigade Alaska Expedition* 1956

A full description of "The dietary intake and activities of an Alaskan mountaineering expedition," by J. D. Kinloch, Medical Officer to the expedition, was published in the *British Journal of Nutrition* **13**, 1 (1959) p. 85. With permission of the Editor, the introductory paragraph of the article, the Summary printed below, and four tables on pp. 491–3.

"In 1956, an expedition was made by a four-man party from the 16th (British) Independent Parachute Brigade to the McKinley Range of mountains in Alaska. This expedition, the first British mountaineering expedition to visit Alaska, was led by Captain E. J. E. Mills, Royal Army Service Corps. Its main object was to explore an unknown glacier system and its surrounding peaks. Throughout the six weeks from 26 May to 6 July 1956, while the party was in the mountains and entirely self-supporting, the food consumption and daily activities of the individual climbers were studied. The article was summarized as follows:

1. Records were made of the individual calorie intakes of a four-man Alaskan mountaineering expedition over a period of six weeks. The mean intake for the whole period was found to be 3825 Cal. daily.

2. The daily activities of the expedition are described. The mean time spent daily in major physical activities was $5^{1}/_{2}$ hours, in minor activities $10^{1}/_{4}$ hours and in resting $8^{1}/_{4}$ hours. These times are compared with those of other expeditions and of two active occupations.

3. It is concluded that, as body-weights remained fairly constant, the four men were in approximate calorie balance, and that for the period of the expedition calorie intake provided an estimate of energy expenditure.

4. The principles of provisioning a small expedition in the field are outlined. It is suggested that, with certain modifications, the standard expedition ration (Types A, B, C, D), supplemented by a few luxury items, fulfils the nutritional requirements of such an expedition. Recommended modifications are a further ounce of high-protein food daily per man, and a daily multiple vitamin capsule, particularly to increase the vitamin C intake.

5. The dietary intake and energy expenditure for various expeditions in the field are compared."

II. *The British Pakistani Forces Himalayan Expedition* 1958

This expedition consisted of nine climbers (seven British and two Pakistanis) and one surveyor. There were also seven Hunza porters in support. The object of the expedition was to make the first ascent of Rakaposhi, 25,550 feet., in the Karakoram.

TABLE 1: ALASKA EXPEDITION, 1956

(A) Contents of a man-day ration from a 2 × 8 man-day standard ration pack and a 4 man-day emergency ration pack and (B) extra luxury items for the whole expedition. (*Table 2 in* British Journal of Nutrition)

A (all values in oz)

	Type A	*Type B*	*Type C*	*Type D*	*Emergency ration*
Pemmican	2	—	—	—	—
Corned beef	—	3	—	—	—
Stewed steak	—	—	4	—	—
Luncheon meat	—	—	—	2	—
Sardines	1 1/8	—	—	1 1/8	—
Cheese	—	2	2	—	—
Porridge oats	3	—	3	3	1 1/2
Grapenuts	—	1 1/4	—	—	—
Nut pemmican	—	—	—	—	2
Soup	—	—	—	—	1/2
Mint cake (Kendal)	—	—	—	—	2
Cake (fruit)	2	—	—	2	—
Steamed pudding	—	2 1/2	2 1/2	—	—
Glucose tablets (Horlick's Energade)	—	—	—	—	3/4
Orangeade powder (Army)	—	—	—	—	2
Sugar		4			4
Condensed milk		1 1/2			—
Tea		1/4			—
Butter		1 7/8			—
Biscuits (Army)		3			—
Biscuits (sweet)		2			—
Chocolate		4			2
Sweets		2			—
Fudge (Horlick's)		—			2

B (except soup, all values in lb; total weight 60 lb)

Soup	16 (packets)	Preserves (various)	2
Meat bars	1 1/2	Fudge	2
Dried vegetable	1	Sugar	2
Dried potato	4	Vita-Weat	8
Baked beans	4	Beverages (various)	6
Rice	2	Tablets (Horlick's and Ovaltine)	4
Nut pemmican	3	Peanut butter	2
Dried fruit	6	W.D. butter concentrate	3
Tinned fruit	6	Salt	2

TABLE 2: ALASKA EXPEDITION, 1956

Protein, fat, carbohydrate and calorie yield/man/day and daily cost/man of the rations used on the expedition.[1] (*Table 3 in* British Journal of Nutrition)

Ration	*No. of days used*	*Protein (g)*	*Fat (g)*	*Carbohydrate (g)*	*Energy (Cal.)*	*Weight (g)*	*Cost*
Standard ration:							
Type A	12	60	150	480	3490	750	4s 7d
Type B	8	55	160	440	3370	770	4s 3d
Type C	6	60	175	470	3710	840	3s 11d
Type D	2	50	150	460	3350	750	3s 10d
Emergency	2	15	60	330	1920	470	2s 6d
Army "Snow"	4	140	190	460	4170	980	>10s
Army G.S. Mk V	5	98	140	550	3860	1230	>10s

[1] The composition was calculated from the manufacturer's figures and the standard tables of the Ministry of Food (1951) based on those of the Medical Research Council, Accessory Food Factors Committee (1945).

TABLE 3: ALASKA EXPEDITION, 1956

Comparison of the daily dietary intake and energy expenditure of men on various expeditions and in two active occupations. (*Table 7 in* British Journal of Nutrition)

Expedition or occupation	*Conditions*	*Length of study (days)*	*Estimated energy expenditure (Cal.)*	*Dietary intake*				*Type of activity*		
				Energy (Cal.)	*Protein (g)*	*Fat (g)*	*Carbo-hydrate (g)*	*Work (h)*	*Minor activities (h)*	*Rest (h)*
Alaska	Whole period	41	—	3825	72	162	515	$5\frac{1}{2}$	$10\frac{1}{4}$	$8\frac{1}{4}$
Cho Oyu,[1] 1952	Approach march	18	4370	4270	108	110	713	5	2	17
	At 15,000 feet	4	3220	3625	64	80	640	2	4	18
	Over 19,000 feet	9	3960	3190	42	71	596	4	0	20
	At 20,000 feet	9	—	3150	45	104	547	2	4	18
Everest,[2] 1953	Approach march	26	—	4328	110	231	453	—	—	—
	Base 18,000 feet	—	—	3786	81	190	437	—	—	—
	Over 20,000 feet	—	—	3869	75	184	478	—	—	—
	Assault	—	—	3208	46	54	638	—	—	—
Antarctic[3] (Scott in 1912)	Sledging	—	—	3975	85	125	690	—	—	—
North Greenland[4]	At base	11–14	3580	3910	126	163	447	$4\frac{1}{2}$	$11\frac{1}{2}$	8
	Sledging	10–19	5240	4770	117	292	418	$6\frac{1}{2}$	$8\frac{3}{4}$	$8\frac{3}{4}$
British Army Cadets[5]	—	14	3420	3430	99	123	488	4[6]	$11\frac{1}{2}$[6]	$8\frac{1}{2}$[6]
Coal miners[7]	—	7	3660	4030	121	190	500	$6\frac{3}{4}$	$9\frac{1}{2}$	$7\frac{3}{4}$

[1] Pugh, L. G. C., 'Food consumption and energy balance at various altitudes,' London, 1953.
[2] Pugh, L. G. C., *Proc. Nutr. Soc.* **13** (1954) 60.
[3] Bertram, G. C. L., *Proc. Nutr. Soc.* **13** (1954) 69.
[4] Masterton, J. P., H. E. Lewis, E. M. Widdowson, *Brit. J. Nutr.* **11** (1957) 346.
[5] Edholm, O. G., J. G. Fletcher, F. M. Widdowson, R. A. McCance, *Brit. J. Nutr.* **9** (1955) 286.
[6] Approximate values only.
[7] Garry, R. D., R. Passmore, G. M. Warnock, J. V. G. A. Durnin, *Spec. Rep. Ser. med. Res. Coun., Lond.*, no. 289 (1955).

TABLE 4: ALASKA EXPEDITION, 1956

Comparison of various expedition and army rations. (*Table* 8 *in* British Journal of Nutrition)

Ration		Pack		Per man-day							
Description	*Type*	*Type*	*Weight (kg)*	*Gross volume (ml.)*	*Gross weight (g)*	*Net weight (g)*	*Cost*	*Energy (Cal.)*	*Protein (g)*	*Fat (g)*	*Carbo-hydrate (g)*
Alaska	Standard	Sixteen man-day	15·7	1860	990	850	4*s* 3*d*	3370	60	160	465
	Emergency	Eight man-day	3·4	1410	480	480	2*s* 6*d*	1920	15	60	330
British Army [1]	"Snow"	One man-day	1·1	2130	1130	960	>10*s*	4140	141	191	464
	G.S. Mk V	One man-day	1·6	3210	1580	1300	>10*s*	3860	100	140	550
	"Compo"	Ten man-day	18·9	2850	1890	1160	6*s* 2*d*	4100	129	198	448
Everest [2]	Assault	One man-day	1·8	—	1810	1580	—	3208	46	54	638
	"Compo"	Fourteen man-day	20·2	—	1440	—	4*s* 6*d*	4800	—	—	—
Antarctic [3] (Scott in 1912)	Sledging	Bulk	—	—	—	960	—	3975	85	125	690
North Greenland [4]	Sledging	Bulk	—	—	—	760	—	4164	99	278	310
Kangchenjunga [5]	Low altitude	Nine man-day	22·5	—	2490	—	—	—	—	—	—
	High altitude	Ten man-day	16·6	—	1660	—	—	—	—	—	—

[1] Smith, H. G., *Proc. Nutr. Soc.* 13 (1954) 45.
[2] Pugh, L. G. C., *Proc. Nutr. Soc.* 13 (1954) 60.
[3] Bertram, G. C. L., *Proc. Nutr. Soc.* 13 (1954) 69.
[4] Masterton, J. P., *et al.*, *Brit. J. Nutr.* 11 (1957) 346.
[5] Evans, C. E., 'Kangchenjunga, the untrodden peak,' Appendix B, by G. C. Band, London, 1956.

The expedition was in the field from 12 May to 6 July 1958. The summit of the mountain was attained on 25 June 1958, by Major (then Captain) M. E. B. Banks, Royal Marines, and Surgeon-Lieutenant T. W. Patey, Royal Navy.

During the early stages of the planning, the members of the party were given the chance of criticizing the proposed rations, and of stating their own special likes and dislikes. As far as possible, the expedition diet was made up to conform with the wishes of individuals. Apart from these considerations, the rationing of the expedition was conditioned by two important factors. Firstly, limited money; and secondly, the leader's wish to keep weight to a reasonable minimum so that the carrying could be successfully done by the climbers alone, should the porters fail.

Records were made of amounts eaten by members of the expedition and of the remains left uneaten in ration boxes. This method provided a useful cross-check on observations. At the end of the expedition the members filled in a questionnaire on the rations and were specifically asked to make the fullest criticism and suggestions. This combination, of observations made during the expedition and the information contained in the questionnaire, made it possible to give an accurate assessment of the rations and to suggest improvements.

Main ration—8 man/day pack (1 compo box layer)

Item	*Man/day Ounces*	*Container weight Ounces*	*Actual ration Type*	*No.*	*Remarks*	*Average amounts actually consumed per man/day at heights between 17,200 feet and 21,500 feet Ounces*
Meat	4 2·5 (Meat Bar)	8 (Meat Bar 5 ounces)	Tin (Meat Bar in metal foil)	4	Corned Beef Stewed Steak Meat Bar	4 (2 only for Meat Bar)
Sweets	2	2	Roll	8	Toff-o-Luxe, Boiled Sweets	2
Oatmeal	2	16	Card Packet	1		1·5
Cheese	2	8	Tin	2		1·3
Chocolate	4	4	Wrapping	8	Milk, Plain, Fruit, Fruit and Nut, Nut Milk	2
Biscuits (Service Plain)	3	6	Packet	4		2
Biscuits (Sweet)	4	8	Packet	4	Digestive, Ginger, Shortbread	2
Sugar	4	1	Packet	32		4
Tea	0·5	0·25	Packet	16		0·5
Milk	1·75	7	Tin	2		1·75
Orange or lemon crystals	1·5	12	Polythene Bag	1		1
Soup powder	0·5	2	Foil Packet	2	Onion, Pea, Beef, Asparagus, Vegetable, Oxtail, Chicken Noodle, Mushroom	0·5
Butter	2	16	Tin	1		1·3
Total net weight	31·25 or 29·75 ounces					23·25 or 21·25 ounces

Gross weight of 16 man/day rations including box=40 lbs.

The main ration

Packing and packaging.—The main ration was packed in an incredibly short time by one of the members and his wife, with a few helpers. The ration was arranged in two 8 man/day layers in a fibre-board box of the same type as that used by the Army to take 10 man/day rations. The box and slide, which goes over it, are extremely tough, weatherproof and light. When emptied and flattened out they provide good insulation between tent-floor cloths and snow. The containers, with a few exceptions, are of normal size available in shops, or issued to the Army in composite rations. Packaging was kept as light as possible, and there were only four tins in the whole ration. It was to be eaten up to a height of 21,500 feet.

Criticism of the ration.—Owing to factors and considerations to which reference has already been made, the ration was light and in comparison to those taken on some Himalayan expeditions, somewhat austere. In general terms, the members felt that the ration was adequate, and had fulfilled the main requirements. That is, it was sufficient, it kept them fit, and they did not suffer from too much loss of weight. It was not surprising, however, considering the austerity of the ration, that they were unanimous in their desire for more variety in all meal elements, and for tastier foods. Meat bars were not popular, and there had been too much chocolate and sweets, but not enough sugar. Another essential item, much in demand, was glucose tablets.

Suggested ration

This ration is a little heavier than the one eaten on Rakaposhi, but when the appetite has constantly to be tempted these extra few ounces are essential. Certainly more would be eaten of this ration than of the other. All container sizes are quite standard, and the cost is not high. Packing could be done by expedition members.

Suggested ration

Item	*Ounces*	*Remarks*
Cereal	1·5	Oats, Grape-nuts, Sugar Puffs, Farex, Weatabix
Bacon	2	
Condensed Milk	1	
Dried Egg	1	
Sugar	6	
Dried Vegetable	1	Including dried potato
Vita-Weat	3	
Nestea	0·375	Makes at least 3 pints of tea.
Sweet Biscuits	2	Digestive, ginger, shortbread, assorted
Butter	2	
Jam	0·5	Plum, strawberry, blackcurrant
or Marmite	0·125	
Orange/lemonade crystals	1	Makes at least 1 pint of orangeade or lemonade
Chocolate	2	Plain, milk, fruit and nut
Drinks	0·25	Nescafé, cocoa. Makes 1 pint
Glucose	1	
Sweets	1	Boiled sweets, Kendal Mint Cake, Toffee
Sardines	1·25	
Soup	0·5	
Fruit Cake	1·25	
Meat	4	Corned beef, pork luncheon meat, tongue, salmon, dehydrated meats
Total net weight	32·625 or 32·25 ounces	

Should it be possible on the march to and from the mountain and at the base camp to obtain adequate fresh supplies, such items as bacon, meat, dried egg, sugar and dried vegetables need not be included in the packed ration, but bought as required. In addition to improving the acceptability of the ration, the weight of packed food for

this period would be cut by almost half. The number of porters required would be less, with a resultant reduction of expense.

The assault ration

Packing and packaging.—This was also packed by one of the expedition members. Each 4 man/days were packed into a light cardboard box, six of which fitted into the same type of fibre-board box used for the main ration. Later the smaller boxes were transferred to kitbags; this was a mistake, for they were not strong enough and several broke open. Others broke up inside rucksacks, which was not popular. A more substantial carton, or stout polythene bag, was certainly required. There was only one tin, and the orange and lemonade powder was repacked into alloy extruded tubes or polythene bags. The ration was to be eaten from 21,500 feet.

Assault ration—4 man/day packs (in cardboard boxes)

Item	*Man/ day* Ounces	*Container weight* Ounces	*Actual ration* Type	No.	*Remarks*	*Average amounts actually consumed per man/ day at 21,500 feet and above* Ounces
Corned Beef	2	8	Tin	1		2
Oatmeal	2	1	Wrapped	8	In block form	2
Chocolate	2	2	Wrapped	4		1
Toff-o-Luxe	2	2	Roll	4		1
Biscuits, (Service, Plain)	1·5	6	Packet	1		1
Sugar	6	1	Packet	24		6
Tea	0·75	0·25	Packet	12		0·5
Milk	2	4	Tube	2	Condensed	2
Orange and lemon crystals	2	8	Tube or polythene bag	1		1
Soup powder	0·5	2	Foiled packet	1		0·5
Total net weight	0·75 (1 man/day)					18
Gross weight (including container weight)		6 lbs. (4 man/day)				

Criticism of the assault ration.—The ration was based on the 19 ounces diet used successfully by Waller on Saltoro Kangri in 1936. For a party which was expecting to do its own portering over 21,000 feet, it seemed that the experiment was well worth repeating. When the climbers arrived at Camp IV, they were all well acclimatized and fit, and with good appetites. From this point they weakened very rapidly until, after seven days at this height and above, the feebleness of the party was quite pronounced. The ration was insufficient and lacked interest. Criticism by the members was very similar to that of the main ration, with an insistence on a heavier ration.

Suggested assault ration

An assault ration must be light, especially if the expedition cannot afford to employ a large number of high-altitude porters. The question is, how much can the weight be pared down? Our experience suggests that at least 24 ounces are necessary. On Everest the average consumption of the 33-ounce ration was between half and a full ration: roughly 24 ounces. Band, writing of the diet on Kangchenjunga in 1955, suggests a 32-ounce ration. His plan is to give the climber, with his jaded appetite, a wide variety of choice, based on the assumption that a "little bit of what you fancy does you good." We have tried to suggest a ration for future mountain expeditions, particularly when undertaken by a small private party unable to afford a large team of high-altitude porters.

Local Purchase

Forty pounds of rice were bought in Gilgit. It proved to be far in excess of our requirements, for the British members of the team had become a little tired of curry and rice dishes by the time we started the approach march. With the help of Captain Shah Khan, one of our two Pakistani members, a contract was made with the numbadar at Jaglot to provide the expedition with one, sometimes two, sheep a week and as many chickens, potatoes and eggs as the village could spare. These were brought up to Base Camp once a week. This fresh food, together with other luxury rations, supplemented the main ration, not only in Base Camp but higher up the mountain. In consequence, chicken was eaten at Camp I, and eggs up to Camp II at 19,200 feet. There is no reason why eggs packed in alloy containers should not go to the highest camps. Small quantities of chicken, pre-cooked at Base Camp, could also take the place of some tinned meats on the mountain.

Luxury Food

An inexpensive selection was presented to each member. These foods were then modified according to their wishes. The total list was:—

Food	*Pack*	*Number*	*Food*	*Pack*	*Number*
Condensed Milk	7 oz tins	24	Tinned Pineapple	Large tins	2
Nescafé	2 oz tins	48	Mint Cake	8 oz slabs	40
Nesquik	8 oz tins	12	Jams, various	2 lb tins	6
Corned Beef	8 oz tins	24	Weatabix	1 lb packets	12
Stewed Steak	16 oz tins	20	Sage and Onion	4 oz packets	6
Blancmange Powder	16 oz tins	6	Plain Flour	3 lb packets	12
Orange Powder	2 lb tins	5	Pepper	1 oz drums	4
Lemonade Powder	2 lb tins	5	Dried Fruit	1 lb packets	20
Sugar	16 oz packets	32	Curry Powder	8^1_4 oz tins	8
Golden Syrup	16 oz tins	4	Tomato Ketchup	12 oz bottles	4
Tea	4 oz packets	20	Worcester Sauce	Large bottles	2
Chocolate Wheatmeal	7 lb tin	4	Pan-Yan Pickle	Bottles	4
Chicken Noodle Soup	2 oz packets	8	Green Label Chutney	Jars	4
Oxtail Soup	2 oz packets	7	Dried Yeast	2 lb packets	2
Pea Soup	2 oz packets	6	Butter	1 lb tins	12
Asparagus Soup	2 oz packets	6	Cheeses		2
Vegetable Soup	2 oz packets	6	Rice	1 sack	40 lb
Beef Soup	2 oz packets	6	Fudge	Packets	50
Onion Soup	2 oz packets	6	Energade Tablets	Packets	50
Mushroom Soup	2 oz packets	6	Whisky	Bottles	12
Mustard	1 oz tubes	12	Gin	Bottles	12
Bounty Bars	1 lb packets	3	Rum	Bottles	1
Salt	1^1_2 lb tins	16	Beef Suet	4 oz packets	6
Marmite	2 oz tubes	24	Raisins	12 oz packets	8
Potato Strip	12 lb tins	2	Grapenuts	10 oz packets	20
Dried Onion	4 lb tins	1	Oxo	6 cube tins	50
Dried Cabbage	4 lb tins	1	Lard	2 lb tins	4
Baking Powder	8 oz tins	4	Cake Mix	14 oz packets	6
Bisto	8 oz packets	6	Peanut Butter	12 oz jars	6
Vita-weat	1 lb packets	10	Potato Mash Powder	8 oz tins	10
Tinned Peaches	Large tins	2	Blancmange Powder	1 lb tins	12
Tinned Pears	Large tins	2	Ostermilk No. 2	1 lb tins	24

Criticism of the luxury ration.—In general the luxury ration met with approval. A greater variety of tasty meats should have been taken. The quantities of jam, tinned fruit, Vita-weat, pickles, sauces, suet, lard, peanut butter and yeast, were all inadequate, and could have been increased fourfold. The omission of tinned fish was a serious error. Dried fruit and cereals should have been doubled. There was more than twice the quantity of blancmange powder required, and tinned fruit-cake could take the place of at least half the cake-mix. Dried soups could be cut out completely.

These foods were not eaten only at Base Camp. Small quantities of most items were taken to the three lower camps to add interest to the main ration. These were always eaten in preference to items in the main ration. These extra rations are not

essential. Some are advisable, but they are costly, and if money is short the quantities can be reduced without hardship. Some bread was made in Base Camp, and as was expected it proved extremely popular. More bread could have been made had the cook, or a Hunza, been taught the process.

Porters' food

The Field Supply Depot of the Pakistan Army Service Corps at Gilgit provided local food for the Hunza porters as they do for all expeditions. These rations are the same as those issued to Pakistani troops in the lofty frontier outposts. The meat element was provided by the mutton and chickens brought to Base Camp. In consultation with Shah Khan the porters decided on what they would require at Camps I, II and III. Quantities of the following foods and drinks were also added at each camp:— soup powder; tea; coffee; sugar; milk; orange and lemonade powder; Oxo; chocolate; sweets.

Emergency rations

Each climber and Hunza carried, for use in emergencies, a block of Horlick's Rum Fudge, and two packets of the same firm's "Energade" glucose tablets. Together these provided a source of food and energy sufficient for forty-eight hours. Their total weight was about 8 ounces.

The rationing plan on the mountain

From Camps I and II, Base Camp could be reached easily in a few hours and on long sections of the route between them ropes were fixed. It was therefore only deemed necessary to leave reserves of 16 and 32 man/days food, respectively, at these two camps. Camp III was, in reality, the advanced base, and here the expedition concentrated to wait for weather favourable for the assault. Fourteen days of the main ration for eight climbers were stocked at this camp. The Hunzas had ten days of their own food and four days of their main ration. In addition, ten days' assault rations for eight climbers were carried to Camp IV. In theory, Camps IV, V and VI were to be established on consecutive days with the attempt on the summit, return to Camp IV being made on the fourth and fifth days. Again in theory there were five days' reserve rations. In practice, because of delays caused by bad weather, and the abandoning of food at the two top camps, the only edibles left at Camp IV after the successful ascent were several packets of Toff-o-Luxe, tea and lemonade crystals.

BIBLIOGRAPHY

Mills, Captain E. J. E., "The Parachute Brigade Alaska expedition 1956," *Alpine Journal* **62** (1957) pp. 121–32.

Mills, James [E. J. E.], 'Airborne to the mountains' (to be published by Herbert Jenkins in the summer of 1961).

Banks, M. E. B., and E. J. E. Mills, "The ascent of Rakaposhi," *Geogr. J.*, **126**, 1 (1960) p. 1.

Evans, C. E., 'Kangchenjunga: the untrodden peak,' 1956. Appendix B. by G. C. Band.

Hunt, J., 'The ascent of Everest,' 1953. Appendix 6 "Diet" by Griffith Pugh and George Band.

Waller, J. E., 'Hints to travellers,' Vol. 2, p. 63. Royal Geographical Society, 1937.

FROM THE *JOURNAL* A HUNDRED YEARS AGO

THE FOLLOWING extract is taken from "Killimandjaro and the White Nile" by James Macqueen, read to the Society on 9 May 1859, and printed in the *Journal of the Royal Geographical Society*, Vol. 30 (1860) pp. 133–5.

"From a very early period of history the most attentive writers have uniformly stated that the mountains round the sources of the Nile were covered with perpetual snow. Ptolemy states this pointedly. Bruce heard that this was the case; so did Major Harris; and also that the hills of Souro to the S. of Kaffa, in about 3° to 4° N. lat., were always covered with snow. Krapf heard this also of the mountains in these parts when he was in Shoa; and finally he states that the mountains around the sources of the White Nile were covered with perpetual snow. Why should this excite either doubt or surprise, when we find the hills in Abyssinia, such as Simien, on the N. of Gondar, rising above the limits of snow, and around the sources of the Tacazze, Pearce found the hills covered with hoar-frost every morning, and the cold exceedingly great? The ancients also placed the sources of the Nile about the equator, for we find the priest of the temple of Minerva in Egypt telling Herodotus that one-half of the waters of Africa ran to the S., and the other half to the N. But, though snow-clad hills covered the mountains round the sources of this far-famed stream, only a few simpletons taught that the melting of these snows occasioned the flood or swelling of the Nile. All the snows on them were and are but a drop in the bucket compared to the real cause, namely, the tropical rains, when the sun returns to the northern torrid zone, during which time the snow falls most heavily. We now know well the cause, nor was that cause unknown to the ancient world. In Lucan's 'Pharsalia' we find the venerable priest Achoreus describing, in the beautiful language of Roman poetry and Eastern ideas, to the great and renowned chief Julius Caesar, the real cause of the flooding of the Nile, namely, the tropical rains from the accumulated clouds collected and condensed near the equator and in the northern torrid zone, as we find is really the case. Julius Caesar was so anxious to learn the position of the sources and phenomena of the Nile, that he said to gain that knowledge he would relinquish the civil war. He sat with Achoreus a whole night in Alexandria discussing these points, while the venerable priest pointedly told him that the flood of the Nile proceeded neither from the softened cold of Boreas nor dissolving snow, but from heavy rains only. The whole passage in Lucan (book X.) is beautiful and instructive, and well worth the perusal. . . .

"In reference to the term 'Mountains of the Moon,' it is of no consequence what that name is intended to convey; sufficient for our purpose in these latter days is to show that immense high mountains covered with perpetual snow do stand round the head of the White Nile. In reference further to the position where Ptolemy has placed them, namely 12° S. lat., and his eastern lake in 7° S. lat., it would almost appear that, by some greatly erroneous information, he had got hold of the high lands to the S. of the lake called N'Yassa, the lake being much farther N.; and thus that lake will be his eastern lake, and Lake Ujiji or Taganyenka is his western lake, or western source of the western branch of the Nile, about 8° separate, and his lake at the junction of the two streams, 5° farther N. than his first lake, is in 2° S. lat., where we are told there is a lake; and thus we have his errors and his features of Africa in this portion of that continent made out. Wherever ancient geographers found a lake, they were sure to carry a river out of it; and if they found another lake in the course they gave this river, they were sure to carry this river to it and from it. In this respect many moderns followed their example."

THE BEHAVIOUR OF CIRQUE GLACIERS

NORWEGIAN CIRQUE GLACIERS. Edited by W. V. Lewis. Royal Geographical Research Series No. 4. *London: Royal Geographical Society and John Murray*, 1960. 9¼×7 *inches; 104 pages; maps, diagrams and plates.* 22*s* 6*d*

THE STUDY OF GLACIOLOGY has fallen into two divisions for far too long. Glacial geologists have concentrated mainly on the evidence of erosion and deposition left behind by former glaciers and ice sheets, whereas the physicists have been interested in the flow of ice as studied by observations of surface movement. It is only during the past decade that measurements of glacier flow in three dimensions have been made, and physicists and geologists have had the opportunity of studying the erosion taking place at the bed of an active glacier. The R.G.S. Research Series publication No. 4 on Norwegian cirque glaciers describes the results obtained from the first tunnel driven through a glacier to bed-rock for the sole purpose of studying the behaviour of a small cirque glacier throughout its entire thickness.

During the post-war revival of interest in glaciology the inspiring teaching of W. V. Lewis in the department of geography at Cambridge created a group of students at both research and undergraduate level, with the keenness to apply new techniques to the study of glaciers. The type of glacier chosen by the group for study was the cirque glacier, which has frequently left its mark in the highland areas of the United Kingdom, and which is found in its active form in Norwegian mountains at a distance reasonably accessible to Cambridge. Lewis and others in the geography department had already made surface studies of this type of glacier and were anxious to test their theories of the movement and erosive action of these glaciers. The work covered by the report shows how capably they carried out the observational programme. In a field where theories tend to be more numerous than the observations on which they are based, it is natural that the greatest value of the work is the comprehensive collection of data on the movement of two cirque glaciers.

The most detailed studies were made on Vesl-Skautbreen, a relatively small and simple cirque glacier in the Jotunheim area of Norway. The knowledge gained there was then used to explain the observed surface features of a more complicated cirque glacier, Veslgjuv-breen, in which some idea of the third dimensional process was revealed by exposures along an ice cliff where the glacier calved into a lake. Reference is also made to some results from two other glaciers in the same region. As is inevitable with eight authors, some minor differences of opinion between them arise, but this does not confuse the overall picture which emerges clearly.

An introduction by W. V. Lewis outlines the events leading up to the investigation and gives credit to the many helpers who took part in the project. The work proper starts with a description of the regional and local geological environment of Vesl-Skautbotn and Veslgjuv-botn by Dr. M. H. Battey. He points out that the lack of variety of geological formations makes the area unsuitable as a place in which to study the lithological control of cirque erosion. The structure of gneissic foliation is said to exercise some control over slopes produced by cirque sapping where the direction of the wall is similar to the strike, but glacial erosion cuts across the structure with indifference in most places. The conspicuous joint planes which are opening up around the two cirques at present are those which are parallel to the present free surface of the rock. This he attributes to spontaneous expansion or dilation of rocks, formerly subjected to compression, as a result of unloading by erosion.

Following the geological background to the study is a detailed description of the bands and layers of Vesl-Skautbreen, which are conspicuous in the photographs of the glacier. Mrs. Grove starts this section by defining her terms carefully, and similar terminology has been followed by the authors of the succeeding chapters. Annual ablation surfaces were identified easily and reliably, both on the surface of the glaciers

where they are visible below the snow line, and in the two tunnels in the Vesl-Skautbreen. A detailed diagram of the features visible on the west wall of the lower tunnel is shown. This is very instructive, but a separate key to the symbols used on the diagram would have been helpful. If a similar diagram for the upper tunnel in the firn region could have been presented, a useful comparison with the lower tunnel could be made. Blue ice layers in the lower tunnel vary in thickness from a few mm. to about 20 cm. and are generally parallel to the underlying ablation surface. It is stated that "there are strong indications that most blue layers are formed within a year after the formation of the ablation surface below," but unfortunately no data on the presence of these layers in the upper tunnel is given to permit the reader to form his own judgement on this point. Variation in the thickness of the accumulation layers from year to year shows fluctuations in local climatic conditions, as recorded by the difference between accumulation and ablation for that year. The average thickness of the accumulation layers indicates that the present glacier is fed by snow concentrated in the cirque by such processes as drifting, eddy deposition and avalanching. The total of eighty-eight bands exposed on the lower surface of the glacier, together with an allowance for the lowest layers which could not be studied, indicates that the oldest layers in the glacier could not be more than 200 years old, while the bulk of the ice is less than a century old.

Still more detail on the structure of certain sections of the glacier is described in the next section by Dr. R. J. Adie, who observed the texture, size and orientation of ice crystals in the different ice layers traversed by the tunnel in the Vesl-Skautbreen. The first section describes the techniques employed, including a full description of the Universal Stage instrument designed for fabric investigations of sections too large for convenient study under a microscope. Ten ice fabric diagrams show strongly oriented crystal structures. These orientations are believed by Adie to be due in part to deformation in the glacier as well as to the original crystallization, although his conclusions are somewhat tentative, and in the case of blue ice bands McCall later attributes all the orientation to the temperature gradient.

The chapter on the flow characteristics of a cirque glacier by the late Dr. J. G. McCall presents the central and most important section of the results. It is clear that his death from poliomyelitis in Alaska has robbed glaciology of an outstanding research worker. He has made a careful study of the literature on glacier flow, and has presented his valuable results clearly against the background of existing ideas. He has also extracted as much from his results as possible. He uses his three-dimensional measurements of movement on the surface and in both tunnels to construct a flow-line diagram. He superimposes on the diagram a pattern of lines of equal speed, based again on all his ice velocity measurements. He admits to some conjecture in constructing this diagram but nevertheless goes on to use the variation of velocity with depth at positions on the glacier. These velocity depth diagrams are very informative where the profiles pass through the lower tunnel, but one may differ from his interpretation of the two upper velocity depth profiles. However, a very useful check of this work is made subsequently when his velocity-depth profiles are used to calculate the changes of dip of the ablation surfaces as they gradually move down glacier. The agreement with the dips recorded by Mrs. Grove is most satisfactory as a means of confirming that independent ablation-surface and velocity-depth studies are consistent with one another. A moderate discrepancy between the observed and calculated dips at the rear of the lower tunnel is attributed to an under-estimation of the effect of basal drag in plotting the "conjectural" lines of equal speed.

McCall gives a clear discussion of his results in relation to Lewis's ideas on rotational slip. The idea of a rotational flow pattern, drawn from the analogy with a rotational landslide in soil mechanics, has served a useful purpose in giving a simplified picture of the motion of a cirque glacier. The present study shows in detail how the flow differs from a pure rotational slip, which is particularly evident in the lower part of the glacier, where the ice moves much more steeply upwards than would be the case with pure rotation, and the dip of the ablation surfaces starts to decrease again as one moves

down glacier towards the terminus, instead of continuing to increase as it would under pure rotation. The authors recognize these facts clearly, but nevertheless McCall, Mrs. Grove and Lewis, in summing up, all continue to use the term "rotational" in describing the observed flow pattern.

McCall presents a satisfactory explanation of the directions of cracks in the glacier in terms of the stress pattern to be expected in different locations. He also describes a simple test used by Dr. Nye to confirm Mrs. Grove's earlier evidence that an "overthrust" appearance at the outcrop of an ablation surface is not due to a thrust-plane, but is the product of differential ablation.

The last eight pages of McCall's contribution deal with the erosive effects of the glacier. He starts by describing the movement of the ice next to the rock, then the condition of the debris-filled sole of the glacier. Debris also falls on to the surface of Vesl-Skautbreen from the headwall of the cirque and is carried to the terminal moraine either by the ice movement, or at times by glissading down the glacier surface. Sapping of the headwall is considered to be the most effective erosive agent, although abrasion by rock debris carried in the ice is also shown to be taking place—both by observation and by some calculations on the strength of rocks and flow characteristics of ice.

The following chapters deal mainly with related studies. Mr. Jackson and Miss Thomas have contributed a short chapter on the survey of surface movement of Veslgjuv-breen which is of more complicated form than Vesl-Skautbreen. In the lower parts of Veslgjuv-breen, where crevassing near the terminal ice cliff is present, both the direction of flow and the vertical component of movement varied considerably between different periods of measurement.

Mrs. Grove then presents a comprehensive study of Veslgjuv-breen, dealing with the motion, banding and accumulation of the glacier, along similar lines to her work on Vesl-Skautbreen, except that she has no tunnels in which to observe the interior of the glacier. She has, however, an ice cliff exposure where the glacier calves into the lake, as well as the movement studies of Jackson and Miss Thomas. She shows quite convincingly that the glacier is a type of compound cirque glacier, divided into two main sectors each of which has flow characteristics similar to those of Vesl-Skautbreen. The regime of the two main sectors differs widely at times, since in warm years the entire accumulation of one sector may be melted away. At the junction between the two sectors, intense compression and tilting of layers takes place. The variable movement of the lower part of the glacier determined by the survey is attributed to a type of block faulting, as far as vertical motion is concerned, while changes in the direction of motion are put down to the varying influence of the two sectors on this part of the glacier.

The next chapter describes a study of temperature variations in bergschrunds made by the late W. R. B. Battle. The purpose of the investigation was to determine the influence of thaw-freeze action in breaking up the rock walls of bergschrunds and randklufts. The specially devised instrumentation is first described, and reference is made to his laboratory studies on the effectiveness of freeze-thaw action in breaking up rock specimens. In the laboratory the rate as well as the range of temperature change was found to be important. Field studies in bergschrunds at Tverråbreen in the Jotunheim and at the Jungfraujoch in Switzerland both show that temperature changes are relatively small and slow in action. At the Jungfraujoch little frost-riving is visible, which appears consistent with the small range of bergschrund temperatures. However, the frost-riving visible in the bergschrunds of the Norwegian cirques is felt to be the result of more open bergschrunds permitting slow temperature changes to produce riving in a fashion that could not be reproduced in the laboratory experiments. Although frost-riving is clearly the major process on the headwall above the glacier, Battle's results show that it is much less effective within the bergschrund. Although Battle does not develop the argument from this point, one needs to postulate some process such as the dilation cracks put forward by Dr. Battey in order to account for sapping within the bergschrund. However, Battle suggests that the frost-riven appearance within

bergschrunds remains from a time when the cirque glaciers were smaller and more headwall was exposed. His work is of considerable value in showing that undue stress on freeze-thaw action within bergschrunds has been given by most writers. His death while engaged on field-work on Baffin Island is clearly another considerable loss to glaciology.

In the final chapter on the problem of cirque erosion, W. V. Lewis applies the lessons of Vesl-Skautbreen to the explanation of a typical English Lakeland corrie. He shows a photograph of the corrie containing Blea Water, while diagrams are used to show that the longitudinal profile through the corrie is approximately in the form of an arc of a circle. A simple calculation shows that the corrie is large enough to allow the ice, which must formerly have filled the basin, to rotate. While admitting that this idea of a rotating cirque glacier scouring out a basin of circular cross-section is probably an over-simplification, he feels that it is a reasonable first approximation which explains the resultant feature.

Preliminary publication of some of the above work in scientific periodicals made the results on the flow of Vesl-Skautbreen generally available soon after its completion. On the other hand, crystallographic studies, which were in the forefront of such investigations when they were made, have lost their impact now that they are finally available in print, owing to prior publication of later investigations by people such as Rigsby and Meier. The reviewer is not guiltless in this regard, but feels that it must be stressed that Research Publications of this type must either be produced speedily, or it should be seen that the more important sections are published individually in advance. In the latter case, the function of the monograph is to draw the varied lines of investigation into a composite and consistent picture of all the processes involved.

'Norwegian cirque glaciers' does present a very useful comprehensive picture of all the processes involved, and the threads are drawn together into a single picture by McCall's chapter in particular, and to some extent also by Mrs. Grove and Lewis. One possible criticism, which will be verified by the passage of time if the reviewer is correct, is that the writers have tended to underestimate the importance of their own observations. They have been reluctant to throw overboard commonly accepted ideas which are inconsistent with their observations, even though they point out the inconsistencies quite clearly.

The standard of editing of the publication is high. Line drawings are clear and some excellent photographs are included. It is a work that should certainly be in the hands of any serious student of glaciology. G. de Q. ROBIN

[The delay in publication of 'Norwegian cirque glaciers' was due to factors outside the Society's control, as is fully acknowledged in the introduction to the Memoir.—ED.]

FRONTIER DILEMMAS IN CENTRAL ASIA

BRITAIN AND CHINESE CENTRAL ASIA: the road to Lhasa 1767 to 1905. By ALASTAIR LAMB. *London: Routledge & Kegan Paul*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 388 *pages; sketch-maps.* 42*s*

THIS FASCINATING book is indispensable to an understanding of the problems that the India of today has inherited along its Tibetan frontier with China and a valuable introduction to the related problems of Pakistan and Burma. The author has chosen, and frankly stated, a limited approach: the use only of British documents. While this limitation means that similar work must be done by others on the Chinese and Russian documents (the brilliant study by Mary C. Wright, 'The last stand of Chinese conservatism,' Stanford University Press and O.U.P., 1957, is an earnest of what can be expected) before the historical record can be fully presented, it has its advantages. The end of British rule and the creation of the new states of Pakistan, India and Burma, by negotiation instead of as the result of lost colonial wars left British scholars under no pressure to put forward a defensive, *ex parte*, "case" in writing this major chapter in the history of Imperial growth and policy. Professor Lamb's work is not the only example of critical detachment in discussing what were once issues of emotion as well as of power. Detachment is safeguarded by the fact that he has not had access to documents later than 1908, so that practically no reputations of living men needed to be shielded.

The complex frontier from the Pamirs to Burma was, like all Imperial frontiers, an outcome of growth, not of planning. In the eighteenth century, when the fastest communication was by sailing ship, a Governor-General of India, even though guided at long range by his Court of Directors in London, had a proconsular sweep of initiative and authority. Moreover, Warren Hastings was a true man of the eighteenth century. His first emissary to Tibet, George Bogle, was to "investigate the relations between Tibet and China," but was also "to find out all he could about the people, politics, manners and morals of Tibet for the satisfaction of the personal curiosity of Warren Hastings" (p. 9); and when sending a later representative, his own kinsman Turner, Hastings remarked: "I expect no great things from Turner's Embassy, but it will at least satisfy curiosity" (p. 10).

At this time there was a liaison between the East India Company in India and its outpost at Canton. The Chinese would not take enough British goods to pay for all the tea the British wanted, and the difference had to be made up in bullion. It was hoped that the Tibetans would buy things that the Chinese did not want, and pay for them largely in the gold which they were believed to produce in large quantities, which could then be shipped to Canton. It was also hoped that through the Tashi or Panchen Lama (rather than the Dalai Lama) it might be possible to establish a contact with the court at Peking that was denied to the traders at Canton, and thus to improve the conditions of trade with China in general—with the special advantage that if trade were developed through Tibet, it could be monopolized by the Company, while if better conditions of trade were granted at Canton, it would be difficult to maintain the Company's monopoly representation of the British interest there.

After the middle of the nineteenth century there was no more East India Company, and Britain was represented in China by a diplomatic mission at Peking. The structure of British operations then became four-cornered: the Viceroy in India and the India Office in London, the Minister in Peking and the Foreign Office. One result was that the old idea of an approach through Tibet to influence Peking gave way to the idea of trying to get Peking to put pressure on Tibet to settle frontier questions with India. Coordination between the four corners, however, was by no means smooth. Viewed from India, the British Minister in Peking was often half-hearted in supporting "the British interest"—meaning the interest of the Government of India; viewed from

the British Legation, the pressure of this or that particular British interest in some corner of China must not be allowed to promote the increasing decentralization of the country; it was imperative to hold China together; if demands were made on the central government, that government must be kept strong enough to see that the demands were reasonably well carried out. (This aspect is more clearly brought out in Professor Wright's book, mentioned above, than it is by Professor Lamb.)

Meanwhile the Foreign Office was increasingly concerned with keeping both Indian and Chinese affairs in proper proportion in the world-wide interest of the British Empire. This interest had to be protected against French rivalries, reaching up from Indochina through Yunnan toward Tibet; against Russian rivalries, reaching out through Central Asia, and eventually against German rivalries, upsetting the world balance of power; but there was no sense in protecting an interest in a way that would provide "me too" pretexts for a rival.

Marxists are prone to assume that Imperialist policies are always closely plotted with devilish cunning and executed with cold, sinister efficiency. Americans who have inadequately digested their own country's vast but relatively new power are prone to the kindred over-simplification that the miscarriage of a major aim of policy cannot be due to the innate bedevilment of political enterprises but must be explained by criminal sabotage. This book contains rich material for the correction of such shallow assumptions. Professor Lamb is no theorist, but he amply illustrates the tendency of complex frontier situations to "behave in their own way," despite planning that is intended to be far-sighted and flexible.

He cites both "the classic dilemma set out in 1864 in the famous memorandum of Prince Gorchakov; the frontier was disturbed by the peoples beyond, but an advance of the frontier merely brought an advance of the area of disturbance" (p. 101), and the opinion and question of the Duke of Wellington "that the outcome of a successful military expedition in Asia was often no less embarrassing than a defeat. Where should it stop?" (p. 171). For under all the stratifications—the top level of world power politics, the diplomatic level of India's frontier with Tibet, and the ability or inability of China to answer responsibly for Tibet—there was the behaviour of the frontier peoples, Bhutan, Sikkim, Nepal. All had their intimate ties with Tibet, not only of religion and trade, but the intermarriage of powerful families; but these ties were offset by chronic hostilities and feuds. Gulab Singh of Jammu, Dogra feudatory of the Sikhs who were Britain's allies, made conquests in Western Tibet that threatened British diplomatic relations with China and also brought him close to Nepal, whose contacts with other states Britain was anxious to limit; especially with Jammu, the combination of whose "abundant resources" with "the malevolence and bravery of the Gurkha Army" (p. 68) might be explosive.

Nepal, indeed, was a special problem. The Gurkhas, though defeated once (when overloaded with loot) by a Chinese army, repeatedly showed their ability to raid into Tibet and to encroach in Sikkim. They made their frontier quarrels an excuse for demanding arms from the British, but it was more than once suspected that they might use these arms for aggression, not for self-defence, and at times it raised the problem that "many Gurkhas who would normally be recruited into the Indian Army would now be retained for the army of Nepal" (p. 155).

Decisions that had to be taken in recurring crises frequently demonstrated that a frontier may have to be pushed forward, not because an empire is imperialistically bent on further expansion, but because it is drawn in by the suction power of a frontier that perversely insists on "behaving in its own way." Even a decision to halt along a neat geographical demarcation like a well-defined watershed may not work if both sides of the watershed can be exploited by a yak-and-sheep economy practised in exactly the same way, but with rival claims, by Tibetans and Nepalese, Tibetans and Sikkimese, or Tibetans and Bhutanese.

It is not surprising that the shifts and involutions of frontier history led to strange transfers of favourite arguments. At one time French Catholic missionaries on the Chinese side of Tibet were eloquent in arguing that the British ought to intervene with

force in Tibet, because the poor Tibetans would be overjoyed to be "freed from the heavy yoke of the Lamas" (p. 121). A Protestant missionary described the Dalai Lama as a "Moloch in human shape—a worthless abject being" (p. 113). At the time of the Younghusband expedition to Lhasa in 1904 there was a renewal of "the old theory that the Tibetan people would welcome deliverance from the oppressive rule of their overlords, both Chinese and monastic" (p. 296). (There is a sombre passage that might have been quoted here from 'The unveiling of Lhasa,' by Edmund Candler, who accompanied Younghusband, on the sad necessity of slaughtering some of the poor devils, in order to liberate the rest.)

For these reasons I cannot agree with Professor Lamb's suggestion—at least I think this is what he means—that Tibet might be better off today if Curzon and Younghusband had succeeded in bringing it "under some measure of Indian protection," especially since he adds that "the twentieth century has not provided ideal conditions for the flourishing of political anachronisms like the Tibetan theocracy" (p. 335). It is not sure that India would have accepted such a legacy. I am more impressed with what he says on p. 206: "The absence of Anglo-Tibetan relations"—read, today, "Indo-Tibetan relations"—"was of little significance provided the Chinese were able to exercise some measure of effective control over the Tibetans." Today the Chinese have that effective control, and with it the burden of history. "The outcome of a successful military expedition in Asia"—once more the Duke of Wellington—"is often no less embarrassing than a defeat. Where to stop?" OWEN LATTIMORE

THE REIGN OF SCIENCE

A BRIEF HISTORY OF THE ROYAL SOCIETY. By E. N. DA C. ANDRADE. *London: The Royal Society*, 1960. 10 × 6½ *inches; 28 pages; facsims., portraits*

THE ROYAL SOCIETY: its origins and founders. Edited by SIR HAROLD HARTLEY. *London: The Royal Society*, 1960. 10 × 6½ *inches; 275 pages; facsims., illustrations*

THE ROYAL SOCIETY is now 300 years old. And to no Englishman would it occur to inquire the meaning of the name, although to a stranger it might well suggest a gathering of crowned heads and their families. Yet sometimes it seems as if the Fellows of the Society themselves fancy that they belong to just such an assembly. Professor Andrade, in his brilliant sketch of the Society's history, speaks of a President as "reigning," and even "ruling;" and such, once or twice, has almost literally been the case. The Society, besides, although a private corporation, possesses great powers and privileges which enable it to influence the progress of science in this country, although it declines to guide or plan. In the early days of its history the Fellows were inclined to envy the sister society in France, which was sponsored, supported and allotted its tasks by the Government of the day. But such a spirit has long yielded place to pride in independence, and to a determined individualism.

The 'Brief history' early puts the reader in the author's debt by explaining the three mysterious Latin words, *Nullius in Verba*, which appear beneath the Society's handsome coat of arms. The phrase is taken from a couplet of Horace, which runs:

> *Ac ne forte roges, quo me duce, quo lare tuter,*
> *Nullius addictus iurare in verba magistri.*

This Professor Andrade renders: "And do not ask, by chance, what leader I follow or what godhead guards me. I am not bound to revere the word of any particular master." In other words, "Break loose from authority, see for yourself!" And authority in those days meant the old books, and in particular the works of Aristotle. The injunction to self-reliance came first from Roger Bacon, as early as the thirteenth century, but modern historians of science forget this, and begin their tale with Francis Bacon and

the *Novum Organum*. Professor McKie, however, in his opening essay in 'The Royal Society' on the Society's origins, goes behind Sir Francis as far as the early sixteenth century, where we find the great pioneering works of Biringuccio, Vesalius and Copernicus, all of which had their repercussions in England. But at Oxford, even down to the Restoration, Aristotle still held sway as the supreme Master, and, indeed, has his disciples there today. It was fortunate that Sir Thomas Gresham stood firm in his intention to found his College with its seven Professors in London, and not in either of the ancient universities. For Gresham College was undoubtedly the cradle of the New Philosophy in England.

Professor McKie cannot escape noticing, however, that the new books and the new teaching had strong, useful, even utilitarian aspects. This he admits, "provided it be understood that these terms are not to be taken as having the same meaning as economic." Presumably by "economic" he understands "for the purposes of gain," but even "useful" is an ugly word to the scientist of his generation, as will presently appear. And he does not allow its relevance to the splendid *De Magnete* (which it was one of Galileo's offences to have read), the record of the experimental work of Dr. William Gilbert, who is here accounted the first modern scientist in England. Nevertheless, Gilbert's friend and collaborator Edward Wright, a fellow Copernican, devoted his laudatory preface almost entirely to a demonstration of the usefulness of this investigation of the lode-stone.

Everyone must have encountered the scientist who makes a boast of the "beautiful uselessness" of his researches, and it is the case that some stigma attaches to the man who develops the technical side of his specialized knowledge, or who goes into industry. Yet the pursuit of science for its own sake will always persist. It does not require the stimulus of such unworthy and often ridiculous attitudes. Here, however, we have an example of where the cult of the "pure" scientist can lead. Robert Boyle as a young man wrote to his former tutor, a Frenchman, to tell him that he was now studying natural philosophy, mechanics and husbandry, "according to the principles of our new philosophical college, that values no knowledge, but as it hath a tendency to use." The last phrase quite horrifies Professor McKie, and Boyle goes on further to ask his friend to bring over "good receipts and choice books" in these subjects which will make him very welcome to "our Invisible College." Now it has been usual to follow Birch (1744) in identifying the Invisible College with the small group of men, including Doctors Wilkins, Wallis and Goddard, who met for experiment and discussion in and near Gresham College between 1645 and 1647, and subsequently in Oxford. This was the group from which the Royal Society sprang. But the word "use" has stuck in Professor McKie's throat, and he argues elaborately that Boyle could not have been referring to such men as these. He was in touch, perhaps, with the Pansophists, a group who had eagerly welcomed the ideas of the great educator Comenius, and had planned a College at Chelsea. But the rising political disorders had sent Comenius back to the Continent five years before Boyle wrote, and with all his plans wrecked. Morover the young Robert, who was educated abroad, had met the famous Père Mersenne, who from his cell had established a true Invisible College: a wide circle of learned men attached to him by the unseen threads of correspondence. Nor is there any evidence that the English group would take no interest in useful knowledge or in the problems of husbandry, as Professor McKie would have us believe. Rather to the contrary. Dr. Wilkin's 'Mathematical Magic,' published in 1648, was entirely practical; and the first book to which the Royal Society was to give its *imprimatur* was John Evelyn's 'Sylva.' Boyle's enthusiastic claim for "usefulness," besides, carried the implications of the Society's motto—the rejection of the useless verbal disputations of the Schools.

But setting this controversy aside, we can here read *verbatim* Dr. Wallis's recollections of the Society's origins, of the circumstances of the removal to Oxford, and of the return to Gresham College. Here they found that Samuel Foster, the former Astronomy Professor, was dead, and Laurence Rook had succeeded to his Chair. Rook took an active share in their plans, but he died before any formal association took

place. What Wallis had to tell is supplemented by Seth Ward's recollections of the work done at Oxford, and by some reminiscences in Wren's *Parentalia* and in the inaugural lecture which Sir Christopher delivered at Gresham College in 1657. For he succeeded Rook.

There are presented in the 'The Royal Society: origins and founders' twenty-one biographies of the Founders or early Fellows, each of very great interest, besides a rather unsympathetic notice of the Society's Royal Patron. Yet the King was genuinely interested in experimental science, and strongly convinced of its value. It was his French mistress, the Duchess of Portsmouth, who set the ball rolling that led to the establishment of the Royal Observatory. One of her protégés was a Frenchman who declared that he had solved the problem of finding the longitude at sea. The King, at her instance, ordered a committee of Fellows of the Royal Society to investigate his claim. They coopted young John Flamsteed, whom Jonas Moore had just brought to London. Reading his adverse report, King Charles was shocked to learn that contemporary knowledge of star positions was quite inadequate for the method proposed. Within a matter of weeks the building at Greenwich in the Royal Park was begun. The Royal Observatory expressed not a mere "interest in astronomy" as here suggested, but the realization that the navigator needs the pure mathematician if his problems are to be solved.

The biographies are arranged as far as possible in the order in which their subjects appear in the Society's history, and pride of place goes to Dr. John Wilkins, Chaplain as a young man in the household of King Charles's married sister. He himself married a sister of Oliver Cromwell. Yet after the Restoration he became Bishop of Chester. In fact everyone spoke well of him and he died "lament of all," said Robert Hooke, who for most people had a waspish tongue. Hooke himself, "needy and subordinate" as Professor Andrade describes him, was not a Founder Member of the Society, but directly they had their Charter he was made Curator. This was in 1662. The qualities of the ill-favoured sickly youth had been recognized within two years of his coming up to Oxford (from Dr. Busby's school) with a chorister's place. By 1655 he was already being made welcome at the "experimentall philosophicall clubbe," and was assisting Robert Boyle in his laboratory. This of itself makes nonsense of Professor McKie's argument that when at the self-same age of twenty Robert Boyle reported to a friend that the "corner-stones" of the Invisible College visited him now and then, he could not have been speaking of the Gresham College group. Gifted young nobleman as he was, and fresh from meetings with great Frenchmen, he would yet have been unlikely to have been noticed (declares the Professor) by such scholars as Dr. Wilkins, Dr. Wallis and their associates. The truth is that science makes nothing of age or social status where it finds a true eagerness of enquiry.

Professor Andrade's biography of Hooke, so appreciative of his manifold genius, is one of the most attractive in Sir Harold Hartley's book. It is followed by that of Lord Brouncker, mathematician and first President. He made a fine figure behind the fabled Mace, but eventually outstayed his welcome in his office. Brouncker was a Royalist, and although he did not go abroad with the exiled King, he was one of the Royalist group who played a leading part in interesting Charles II in the newly formed Society. Most prominent among them was Sir Robert Moray who, like Alexander Bruce, Earl of Kincardine, had spent the period of the Protectorate on the Continent. There is disappointingly little space given to the contacts and influences arising from this sojourn abroad, although there is some account of the cooperation (and dispute) between Bruce and Huygens over the pendulum clock. Hooke tells us that he himself was present in the Royal yacht *Katherine* when the Earl tested one of the clocks as a possible chronometer for finding the longitude.

Mention has been made of the magisterial powers that have been granted to the Royal Society. Among them is that of officially recognizing the societies which can be represented in the organization known "in the polite jargon of the day" (as Professor Andrade puts it) as I.C.S.U.: in other words the International Council of Scientific Unions. Only through the intermediary of a Royal Society Committee can any

English Society be officially recognized as a member of the International Union for the branch of science that it professes. And it is for the Royal Society to decide what is a "branch of science." For many years it has taken the view that the history of science is not the scientists' concern, and workers in that field have been gravely handicapped, for only in the capacity of individuals could they attend the Congresses of the International Union of the History of Science and Philosophy. It is possible to hope that this situation is even now changing. For to prepare this Tercentenary volume on the origins of their Society the Council has been obliged to secure the cooperation of so distinguished a historian of science as Professor McKie. His attitude to the "useful" need not blind us to the wide knowledge he displays in his most attractive introductory essay.

Geographers may think themselves fortunate that there has always been a geographical committee called by the Royal Society to sponsor them officially at "I.G.U." But the attitude of the Society towards geography has long been what is best described as equivocal. No geographer as such, however distinguished, can hope to add the coveted letters, F.R.S., to his name. The one or two exceptions that have occurred within living memory can be accounted for by the fact that the scientific work honoured could be deemed to lie within the field of some other recognized science. When individual Fellows are questioned on this subject they lamely explain that geography is barred by the Society's Charters, which insist on experiment as the criterion by which true science is known. But this cannot mean laboratory experiment, or where would the mathematician and the astronomer be? Only by chance did the present reviewer discover a possible answer to the riddle. For in the early days of the Society there was much geographical enquiry, and so there continued to be until well into the nineteenth century. But shortly after the accession of Queen Victoria, the Treasurer of the Society published a book.* He was Mr. John W. Lubbock, Vice-Principal of London University. His book was concerned with the *arrangement* of knowledge, a matter which in that age of encyclopaedias and new libraries was indeed important. The author offered his own tentative classification of the branches of knowledge, taking as his three main divisions, History, Philosophy and The Fine Arts. Logically enough Natural Philosophy (the current name for the physical sciences) appeared under the second heading, as did Natural History and Mathematics. But Geography and Hydrography, as well as the History of the Sciences, were placed under History. Geography has remained in exile ever since. And it is amusing to notice that while "The Arts, Trades and Manufacturers" were given a place under Philosophy, they were severely imprisoned within square brackets. This is a reminder that the great technicians also then ceased to appear among the Fellows of the Royal Society. A Smeaton, a Watts or an Edward Troughton is absent today.

By 1830 the Geographical Society of London (later to become Royal) had already been constituted, its founders, as is well known, being members of the Raleigh Travellers' Club. It was inevitable, perhaps, that geography soon came to be identified with travellers' tales—informative, fascinating, but unsystematic, for it was not the traveller's purpose to measure and classify. Although, therefore, it was from the Royal Geographical Society that the impulse came for restoring geography as a University discipline, it was from the self-same Society that the strongest opposition also came. For the explorers and travellers were proud of their amateur status, and poured scorn on the "armchair" geographer.

Save, however, that it lent colour to the attitude then adopted, all this is irrelevant to the history of the Royal Society. They too had their troubles. These are passed over lightly in the histories under review, for a Tercentenary is an occasion only for rejoicing. But it was in 1830 that Mr. Charles Babbage (famous for spending a fortune and a lifetime on designing a computer) published a book entitled 'The decline of

* 'Remarks on the classification of the different branches of human knowledge.' By J. W. Lubbock, 1830. Lubbock expressed some doubts about his placing of geography. He noted that in D'Alembert's system it was a subdivision of Astronomie Géometrique, while 'Chambers Encyclopaedia' included it with Optics, Astronomy, etc., under "Mathematics."

science in England.' It contained a hard-hitting attack on the Royal Society of which he was a Fellow. The Society had indeed degenerated into a social club. The active scientists were far outnumbered by fashionable gentlemen who happened to find science interesting and amusing. Although he had been dead ten years, this state of affairs must be laid at the door of Sir Joseph Banks, who had monopolized the President's office for the monstrous period of over forty years. Granted that his qualities were great—and they shine out from the fine portrait reproduced in the 'Brief history'—he yet became a despot. The Fellows, even the Council, had no control over the affairs of the Society, and this was particularly the case as regards the elections to it. Professor Andrade names two writers who supported the charges made by Babbage: there was also a third, Sir James South. In the *Philosophical Magazine* for November 1830, among books announced as about to be published, was one entitled: 'On the proceedings of the Royal Society, as connected with the decline of science in England: together with the arguments proving that before the Society can regain confidence at home, or respect from abroad, a reform of its conduct and a re-modelling of its Charter are indispensable. By Sir James South, F.R.S., and late Member of its Council.' South had become so dissatisfied that he had made preparations to leave England and work in France, taking with him the fine, and even unique, instruments with which he had equipped his private observatory in Kensington. In July 1830, however, on the advice of Sir Robert Peel, the King had conferred on him a knighthood, together with a generous pension to be applied to his astronomical work. He therefore changed his plans and remained in England. His proposed book appeared only as a simple pamphlet: 'Charges against the President and Councils of the Royal Society,' 1830. Step by step the needed reforms in the Society's procedure were made, and today there are only twenty-five elections annually. These follow a very stringent enquiry into the qualifications of about 300 aspirants to the honour. The total Fellowship is only 600. Yet, owing to the multifarious tasks laid upon the Society by the Government (and perhaps owing also to the pressure of Parkinson's Law), the fine rooms put at their disposal at Burlington House are becoming too cramped. The rooms include a magnificent and spacious library, where the present reviewer has often had the privilege of reading for days together in solitude and silence. Indeed, it has been a temptation to believe that the Fellows, mistranslating their Latin motto, consider books to be forbidden fruit. But this cannot be true of the present President: Sir Cyril Hinshelwood is a past president of the Classical Association.

Mention has been made of the portrait of Sir Joseph Banks. It is only one of an engaging series reproduced in one or other of these two books, and these, in turn, are only a fraction of the Society's historic collection. As the visitor ascends the main staircase he sees on his left the portrait of Fontenelle, who lived to be one hundred years old. And facing the entry is the famous bust of Charles II. Foreign Fellows and Royal Patrons have played a significant part in the Society's history, for its influence has been world-wide as well as nation-wide.

Nevertheless, after reading the decorous official life-histories of these great scientists, the thought occurs that we should understand them better were some of their odd humours also touched upon. They were also men. When Sir Isaac Newton's *Principia* is extolled, we do not venerate his intellect the less for knowing the nature of the Portsmouth papers. Here was a man who desired himself to discover the answers to his own questions. And not all his questions concerned the material Universe. Robert Hooke, again, always so sure that he could do things better than the next man, is endeared to us as we read in his diary how he glutted himself with Kentish cherries when the girls cried them in the London streets—and paid the price. A weak stomach made a peevish man, but he was tireless! A coarse joke went the rounds in 1579 when Sir Thomas Gresham died, but we can let it pass, for we recognize that his more unpleasant personal habits were part and parcel of the business man who realized that the way to advance his country's prosperity was to endow a seat of learning. Remembering these three men, let us salute the Royal Society!

E. G. R. TAYLOR

GEOLOGICAL TIME-SCALES

A REVISED GEOLOGICAL TIME-SCALE. By ARTHUR HOLMES. Reprinted from *Trans. Edin. Geol. Soc.* **17**, 3 (1960) pp. 183–216

THE PAPER UNDER REVIEW, of which the abstract is printed on p. 513–14, is a revision of the geological time-scale constructed by Professor Holmes in 1947. Holmes's 1947 time-scale was based on five determinations of the lead-uranium ratio, four of them on minerals found in certain igneous rocks and one on a Scandinavian Upper Cambrian rock called Kolm. This last is the only one that can be accurately placed in the stratigraphic column. The ages of the beginning and end of the major stratigraphic divisions were estimated from these five determinations on the assumption that a relative measure of the duration of a geological period is provided by the maximum thickness of sediments laid down during that period. The thicknesses used were mainly based on American sections. The age determinations themselves rest on two other assumptions: (*a*) that the minerals are of the same age as the igneous rock with which they are associated; and (*b*) that the age of the igneous episode in relation to the stratigraphic column was known approximately. Both of these may in certain cases be in error.

Further, the maximum thickness of sediments is only a measure of the rate at which the Earth's crust has subsided in geosynclinal areas where an abundant supply of sediment was available nearby to fill the depressions as they sank. The general rule is no sinking, no sedimentation. If little or no sediment were available, sinking of the crust would probably result in an ocean deep. There is, therefore, no valid reason for assuming that the rate of subsidence was the same or different, in the Palaeozoic and the Tertiary, or in one geosyncline as in another.

Since 1947 new methods of age determination have been used: there are Rb/Sr, the ratio of Strontium 87 to its associated Rubidium 87, and K/A or the ratio of Argon 40 to the Potassium 40 with which it is found. Also new estimates of maximum thicknesses have been made, mainly by Marshall Kay.

With regard to the Potassium-Argon ratio there is always a suspicion that some of the Argon may have escaped in the course of time. The uncertainty which results from this possibility is unfortunate, as the method can be applied, among other minerals, to glauconite which occurs in sedimentary rocks of many periods. So many guesses have to be made as to the probable age of the mineral in relation to the age given by the K/A method that, for the purpose of constructing a geological time-scale, most of the results must be discarded.

An important change in the 1959 time-scale is an increase in the age adopted for the base of the Cambrian from about 500 million years (m.y.) to about 600 m.y. The evidence for this reassessment of the age of this important geological horizon is, however, far from conclusive. It is derived from age-determinations on specimens from three widely-separated regions, *viz.* South Australia, the Congo and Oklahoma.

In South Australia the "lowest Cambrian limestones" overlie the Adelaide System which is said to be 24,000 feet thick. It is composed of an Upper or Marinoan series and a lower or Sturtian series. The upper series contains "an assemblage of fossils entirely unlike any known Cambrian fauna." The Sturtian series contains tillites which include pebbles of uranium-bearing granite and pegmatites. From these pebbles specimens were obtained for age determinations by the lead-method.

The results got by two sets of observers differ considerably. The calculated ages are based on the following ratios:

Pb_{206}/U_{238}, Pb_{207}/U_{235}, Pb_{207}/Pb_{206} and Pb_{208}/Th_{232}.

In order to avoid repeating these rather cumbersome ratios I refer to them as 1, 2, 3 and 4 respectively. In 1954 Kulp and others obtained the ages shown in the first line and in 1959 Greenhalgh and Jeffery the results in the second line, all in millions of years.

520	600	(915)	585
610	674	895	675

The number in brackets in the top line has been calculated subsequently to the publication of the other results. These results as they stand are not very encouraging; they might perhaps be regarded as suggesting an age for the granite pebbles of 650 ± 110 m.y. According to Holmes, however, Kulp's results indicate that there has been "loss of both radon and lead" in the samples, while those in the second line "make a typical loss-of-radon pattern." He admits, however, that "no unique solution is possible." It is difficult to see what support they give to an age of the base of the Cambrian of about 600 m.y. which is a higher figure than the average of Kulp's results on a presumed pre-Cambrian rock. Holmes's assessment that the above results show a maximum age of about 700 m.y. is purely subjective, and in any case has little bearing on the age of the base of the Cambrian. That formation is separated in time from the granite pebbles by 24,000 feet of sediments as well as by an unconformity of unknown length during which the pre-Sturtian granites were exposed by the erosion of their former cover, whatever it may have been. The time interval may, therefore, have been very large.

In the Congo, at Katanga, the Kundelungu sedimentary series contains tillite and rests on a conglomerate series. The Kundelungu sediments contain what is described as a "typical late Precambrian fauna," whatever that may mean. The series was affected by the mineralization to which the uranium-bearing minerals of the region are attributed. The ages of the later phases range from 625 m.y. to 520 m.y. In the Kundelungu series there are said to be "beds of grey and greenish shale which should, if Cambrian, have proved to be fossiliferous." The inference from all this appears to be that the Cambrian came into existence later than 520 m.y. ago.

In the Wichita Mountains of Oklahoma, Palaeozoic strata including Upper Cambrian rest unconformably on a complex of crystalline rocks. A biotite from one of the granites of the complex gave ages of 500 m.y. by the Rb/Sr method and 480 by the K/A method. The zircon gave average ages of 517, 523, 550 and about 500 m.y. by the methods 1–4.

Holmes comments that the "biotite ages are on the low side as is often the case while the age-patterns of the zircon results correspond perfectly to a recent loss of lead," and he arrives at a probable age of 500 m.y. Since these granites are almost certainly pre-Cambrian it is difficult to see how even an age of 550 m.y. proves that the base of the Cambrian is 600 ± 20 m.y. As Holmes rightly suggests, acceptance of this greater age implies that some events, particularly in Africa, previously regarded as of pre-Cambrian age, would now become Cambrian. There is, however, no supporting evidence for this assumption.

These interpretations of age determinations are based on assumptions as to possible loss of radon in the history of a mineral, and of gain or loss of lead at some time. They are a purely artificial device designed to bring the usually discordant results given by the ratios 1–4 into some sort of agreement. The corrections which are derived from their application are often so large in relation to the primary age-determinations as to destroy one's confidence in the results themselves.

The evidence for ages within the Cambrian system are also not convincing. The following example is typical. The average of three age determinations on a sample of granite from Cape Breton is 490 m.y. Less than a mile away the same or a similar granite is emplaced in strata extending from Middle Cambrian to perhaps the lowest Ordovician. Why then was not that granite chosen rather than another, the relation of which to the Cambrian is not known?

The Kolm from Scandinavia is discussed once more. Cobb and Kulp examined twenty samples which gave ages ranging from 355 m.y. to 945 m.y. The 207/206 ratio which is usually considered to give the best ages gave a range of 650–945 m.y. Kulp concludes that the minimum age may be about 500 m.y. but "there is no unique solution." It is particularly unfortunate that the age results on this accurately dated geological horizon range so widely as to make them useless for the purpose of a geological time-scale.

The ages of various Cambrian glauconites have been determined by the Rb/Sr method. They range from 412 m.y. for late Upper Cambrian to 584 m.y. for Lower

Cambrian. Adolph Knopf in the *Scientific Monthly* (**85**, 5 (1957) p. 235) quotes age determinations by the same method of glauconites from Texas and Alberta, which gave 401 to 413 m.y. for early Upper Cambrian and 470 for late Lower Cambrian. These give no support to a 600 m.y. age for the base of the Cambrian.

Passing on to later periods, biotites and zircons from tuffs which occur at well-defined horizons in the Lower Palaeozoic of Tennessee have been examined. Although the geological horizon is known, the age of the biotites and zircons thrown up during the volcanic eruptions is guess-work. Biotites are among the early minerals to crystallize from a magma and the date of their formation as separate minerals may be much earlier than the eruption which brought them to the surface. It is well-known that zircons are almost indestructible and those found in the tuffs may have been picked up by the magma from various antecedent rocks.

Uncertainty must, therefore, always attach to age determinations based on these two minerals. This is illustrated by an examination of granites which invaded Lower Devonian strata in Maine, etc., and those which are said to be of post-Tournaisian and pre-Visean age in the Vosges and Black Forest. One may remark that such close dating of a granite as in the latter case is sufficient to raise doubts in the mind of a geologist.

While the biotites are supposed to give reliable ages, the zircons point to ages which are pre-Carboniferous. Holmes, in fact, suggests that traces of zircons derived from an antecedent rock may account for these discordant results. It is probable, too, that the biotite ages may be greater than the age of the intrusives.

Among the changes introduced in the new scale are an increase in the supposed duration of the Silurian and the Jurassic which were formerly based on American sections. The pitchblende deposits of Joachimsthal are now regarded as Permian, as are also the intrusive rocks of the Oslo district discovered to be of that age, although at one time believed to be Devonian. Their lead-uranium ratios, in fact, pointed strongly to a Permian rather than to an earlier age.

The acceptance of an improbably long duration for the Cambrian, and of an age of 600 m.y. for the base of the system, is partly responsible for what is probably a rather exaggerated concave upward form of the curve in Fig. 2, p. 205. The inference drawn from the form of the curve that crustal activity was greater in the Tertiary than in the Palaeozoic is, therefore, not necessarily true and there is no evident reason why it should be.

Geologists must be grateful for the large number of age determinations gathered together in this paper. It seems, however, that most of them are haphazard and do not follow any definite plan of attack on the problem of contructing a reliable time-scale.

O. T. JONES

Reprints of Professor Holmes's paper may be obtained from the publishers, Oliver and Boyd, Ltd., Tweeddale Court, 14 High Street, Edinburgh, 1. The Abstract is printed below, by permission of the author and of the Editors of the *Transactions* of the Edinburgh Geological Society.

"The time-scale constructed in 1947 was based on certain assumptions that have recently been shown to be wrong. Appalachian pegmatites dated at 350 million years (m.y.) and thought to be *Taconic* (Ordovician) are now found to be *Acadian* (late Devonian), while others, dated at 255 m.y. and thought to be *Acadian* can now be referred to the Permian. Other recent evidence consistently leads to an extension of the 1947 scale that carried the beginning of the Cambrian back to about 600 m.y. ago. The scale now constructed from the data available up to October, 1959, is as follows (in m.y.):

Tertiary	70	Triassic	45	Devonian	50	Ordovician	60
70 ± 2		225 ± 5		400 ± 10		500 ± 15	
Cretaceous	65	Permian	45	Silurian	40	Cambrian	100
135 ± 5		270 ± 5		440 ± 10		600 ± 20	
Jurassic	45	Carboniferous	80				
180 ± 5		350 ± 10					

"One of the more significant consequences of this revision is that many dated rocks from Africa and the other 'Gondwanaland' continents which were formerly ascribed to the late Precambrian now become Cambrian. Important orogenic and plutonic phases of a major geological cycle, implying by analogy an extensive system of geosynclines, occurred at about the close of the Precambrian and early in the Ordovician."

REVIEWS

EUROPE

LAND CONSOLIDATION IN EUROPE. A study based on the work of a Working Party on Consolidation of Holdings organized under the Sub-commission on Land and Water Use of the European Commission on Agriculture, F.A.O. *Wageningen: Veenman*, 1959. $9^1/_2 \times 6^3/_4$ *inches; 142 pages; maps, diagrams and illustrations*

Geographers have long been aware of the distinctive patterns stamped on the ground in many European countries by agrarian systems that involve the minute sub-division of holdings and their scattering in small, separate parcels. These systems are usually held to be an obstacle to agricultural improvement and governments have often taken it upon themselves to consolidate holdings already scattered and to try and prevent renewed sub-division and scattering.

The present study sums up the measures taken by a number of European governments in this important field of agrarian policy. The measures include the improvement of settlement patterns, "improvement of the farm structure" (that is, the division of large estates), and such adjuncts of structural reform as road construction and land reclamation; the countries surveyed are Austria, Cyprus, Denmark, Finland, France, the German Federal Republic, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, Switzerland and Yugoslavia. The United Kingdom is excluded because, it is said, its agricultural pattern "differs fundamentally from Continental Europe and land consolidation is not an important structural problem of British agriculture" (p. 8). It would have been more accurate to say that the scattering of holdings *is* a significant problem in several parts of the United Kingdom, as was shown by the surveys made by the Agricultural Land Commission*; but that no systematic official efforts have been made either to study or to remedy the existing state of affairs. In any case, it is a pity that the United Kingdom was not represented on the Working Party.

The pages of the Working Party's report are a mixture of detailed statements about procedure and accomplishments in the various countries concerned, and of general conclusions, such as the statement: "In almost all western European countries, particularly those which are densely populated and which are not equipped with an industry ready to absorb excess agricultural labour, agricultural land has been seriously sub-divided; in some districts this has resulted in minute sub-division and excessive fragmentation. In countries with advanced industrialization, where the excess agricultural population had the possibility to migrate to industrial centres, the real division of the properties has been stopped and in some cases even a reverse trend to the formation of more viable agricultural units has become evident" (p. 11).

The geographer will find much that is of interest in the maps, diagrams and tables that illustrate the changing pattern of agricultural holdings, particularly in the two coloured maps in a folder at the end (these show two villages, one Swiss, one French, before and after consolidation). He who goes further, however, and attempts to read the whole study, will not find it easy to do so. This arises from a number of

* See the *Reports* on the *Yetminster Farm Boundary, Lakenheath Fen Investigation, Over and Bare Fen Investigation, and Swaffham Prior and Burwell Fens Investigation*, Agricultural Land Commission (H.M.S.O., 1952).

circumstances: the study is arranged under the heads of the Working Party's terms of reference, which makes for repetition and lack of continuity; there is necessarily a high degree of condensation; and the style is dull and turgid. B. H. FARMER

TEES-SIDE AT MID-CENTURY. By J. W. HOUSE and B. FULLERTON. *London: Macmillan*, 1960. 9½×7 *inches; 454 pages; plates and text-figures.* 36*s*

This volume offers an invaluable stock-taking of the resources, physical and human, and an up-to-date account of the economic structure, of one of the country's major industrial areas. The area with which it deals is considerably more extensive than Tees-side in the strict sense, and includes the closely associated surrounding areas of Cleveland, the Hartlepools, and the Vale of Tees with Darlington.

Following a summary account of the physical setting, there is an up-to-date review of the mineral resources upon which so much of the industrial development of the area has depended. The human resources of the present day are then examined in the light of the development of the capital, physical and social, with which the area has been equipped over the past century and a half. This section includes a thorough statistical analysis of the growth, structure and distribution of population and of employment in the area. The detailed and authoritative account that is given of the various industries will make the volume an indispensable work of reference about the area. It is a worthy successor to the earlier industrial surveys undertaken by local Development Boards in North-east England. Following upon these, and upon the planning surveys of Middlesbrough and the Hartlepools that were produced in the years immediately after the War, it brings up to date a corpus of factual information on an area that has been the scene of especially great capital investment since the War. Geographers could wish that the economic structure of all parts of the country had been described and assessed in such thorough fashion. A. E. SMAILES

THE GEOMORPHOLOGY OF BRECKNOCK. By TREVOR M. THOMAS. *The Brecknock Society*. Reprinted from *Brycheiniog* **5** (1958) pp. 55–156. 9½×7½ *inches; sketch-maps, plates*

This must be the first comprehensive account of the land forms of a Welsh county to be published and both the Brecknock Society and Dr. Thomas are to be congratulated on producing a very useful local study. Though the work is a compilation, many of the results of Dr. Thomas's own research are incorporated. The treatment of the land forms of Brecknock is conventional, but the inclusion of topics like the swallow-holes on the basal Millstone Grits and of post-glacial gullying reflect some of Dr. Thomas's own interests. Nearly half of the work, however, deals with the question of the evidence for Tertiary planations and with the evolution of the drainage systems. There is a tendency to avoid controversial issues and to give only one of many hypotheses when dealing with the evidence, as for instance in connection with the extent of Triassic erosion and with the relationship of the planation levels to the eustatic hypothesis; but this may be due to a desire to keep the work within reasonable bounds.

The work is pleasantly produced and contains eight good plates—all air photographs. There are some forty maps and line drawings; the latter are useful, but have a certain lack of variety. There is a useful bibliography and it is certain that this work will be consulted by workers in Welsh physiography for some time to come.

M. M. SWEETING

LYON, VILLE INDUSTRIELLE: essai d'une géographie urbaine—des techniques et des entreprises. By MICHEL LAFERRÈRE. *Paris: Presses Universitaires de France*, 1960. 9½×6 *inches;* xii+546 *pages.* 30 NF.

THE URBAN COMMUNITY. By Nels Anderson. *London: Routledge and Kegan Paul*, 1960. 8½×5½ *inches;* xv+500 *pages; tables and bibliog.* 35*s*

These two books differ markedly from one another, but perhaps for that very reason they should be reviewed together, if only to illustrate the value of widely divergent treatment of towns. From France comes a work of immense detail, in which industry is the main theme and from America a work which combines local study with a view of

wide horizons. Both works have their obvious human relevance, but the first is concerned mainly with people at work and the second with their welfare, social outlook and behaviour. The Lyon study deals with the city and its surroundings, yet it raises big questions such as the possibility of locating industry with social advantage to a district and to a whole nation; Anderson claims, with some justice, that though his book deals primarily with American examples it is of wide relevance, for urban problems occur all over the world in varying emphasis. Fundamentally the only problem is the existence of the town at all; and this rests on an elaborate web of economic and social circumstances that can be quickly broken and less readily restored. And as more and more people are absorbed into towns there is a need for constant study of towns by a variety of approaches, geographical, economic, sociological and others; and there is also a need for experiment in methods of investigation by workers in different fields.

Laferrère's book is not easy reading. Fundamentally it is a careful investigation of Lyon and district, with a close analysis of a number of firms, especially those in its main industries. Many British readers would be more attracted to 'La région Lyonnaise' by Jean Labasse and Laferrère, published in 1960 as part of the 'France de demain' series by the same press (reviewed below). But in the solider work, Lyon is put under a microscope: there is the historical introduction common to the writings of French geographers, and a close study of the main industries. Figures are given for the Lyon *agglomération* of nine communes, covering 41 square miles and having 700,000 people—that is, an area and population similar to the city of Manchester. Almost two-thirds of the employed persons work in industry (214,000 out of 342,000) and of these 88,000 are in metallurgy, 35,000 in textiles, 31,000 in building and 29,000 in chemicals. But there are differences of economic organization: works with more than fifty employees have nearly all the workers in chemicals, three-quarters of those in metallurgy and less than half those in textiles. The requirements of space for industries are considerable: the author estimates that most modern factories need a site of at least 13 acres, and many at least twice as much. The range of planning problems caused by industrial needs appears to be no different from that in Britain—why should it be? To a limited extent factories may be decanted to outlying towns: some examples are given, such as the construction of a cable works at Bourg and of plastics factories at Chalon-sur-Saône and Besançon. Allowing that Paris and district has the industrial attraction common to metropolitan areas, how much growth is desirable in the provinces? Recently an area around Lyon called a "Groupement d'Urbanisme" of 181 square miles with 847,000 people has been distinguished, but though much of this area is still rural it is threatened by the spread of industry and housing.

Anderson's book is a sociological study with a full bibliography; it might perhaps have gained strength by a more critical approach to sources and in places may seem a little naïve; it is not, for example, true that "about 1840, Manchester became increasingly industrial, whereas Salford remained quietly residential" (p. 202)—the economic history is more complex than that. But there is much in this book to stimulate thought among all students of towns and much to admire in the sincerity of the author, seen particularly in his choice of New York slum areas for a doctoral dissertation. Dr. Anderson reaches the conclusion that planning is needed for the individual city, for a "regional cluster of related metropolitan areas" and eventually for all town populations. And such problems are beyond voluntary action. For example "fifty or a hundred cities may have to co-operate in conserving and using the water supply of a region" (p. 486). One may have heard this before, but it is worth saying again.

T. W. FREEMAN

LA RÉGION MÉDITERRANÉENNE. By PAUL CARRÈRE and RAYMOND DUGRAND. LA RÉGION LYONNAISE. By JEAN LABASSE and MICHEL LAFERRÈRE. (France de demain, IV and V). *Paris: Presses Universitaires de France*, 1960. 9 × 6½ *inches;* 160 *pages; maps and plates*

These are two volumes in the series "France de demain" which is being published by

Presses Universitaires. Their format and *décor* are suggestive of books for juveniles, but in fact they are intended for university students and the general public. They have a strong economic bias and seem meant to demonstrate the great strides forward France has made in recent years to modernize her economy. Both begin with a sketch of the physical setting of the region and then go on to describe demographic changes, the state of agriculture and industry, together with the great developments in them, the importance of the tourist trade and, finally, the significance of the largest town in each, Marseille and Lyon. Much stress is laid on the recent extension of the control of the waters of the Rhône and Durance, especially at Donzère-Mondragon and Montélimar, for the purpose not only of producing hydro-electric power, but also of enabling large areas of the lower valleys of the rivers to be irrigated and the navigation of the Rhône to be improved. The books cannot be described as easy to read, but to anyone who wishes to gain information about the economic progress of the two regions they will give a greatly detailed description of all the important features.

E. D. LABORDE

SOME OBSERVATIONS ON BY-PASSED SWALLOW-HOLES IN THE MEUSE AND LESSE VALLEYS. By GORDON T. WARWICK. *Mém. Colloq. internat. Spéléol., Fed. Spéléol. de Belgique, Bruxelles*, 1958, pp. 66–74

This short paper given by Dr. Warwick at the International Speleological Colloquium in 1958, describes some interesting examples of swallow-hole and cave development in the Meuse and Lesse valleys. Variations in the morphology of the swallow-holes and caves are discussed. The effects of a series of successive rejuvenations upon these rivers are examined and some generalizations concerning swallow-hole development are made. Under certain conditions rejuvenation causes the swallow-holes to absorb the whole of the normal flow of the river, the wave of rejuvenation passing into the cave and not up the stream course; this is happening to a certain extent in the Lesse Valley.

The paper is illustrated by some clear and bold diagrams; misprints owing to the paper being printed abroad are rather numerous. The paper is a useful example of how the detailed study of a series of swallow-holes and caves might throw light upon the morphological history of a limestone area.

M. M. SWEETING

DIE HÄFEN DER NÖRDLICHEN ADRIA UND IHRE BEZIEHUNGEN ZUR ÖSTERREICHISCHEN AUSSENWIRTSCHAFT. By JOSEF WARTHA. *Folge 7, Tiroler Wirtschaftsstudien. Innsbruck: Universitätsverlag Wagner*, 1959. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches; 118 pages; text figures*

This monograph is particularly interesting since in large measure it develops with recent statistics some of the aspects of geography contained in Dr. A. E. Moodie's book 'The Italo-Yugoslav boundary' published in 1945, although there is no mention of this book in the otherwise excellent bibliography. The study is particularly informative on matters connected with the hinterlands of Trieste and the other ports of the northern Adriatic. These ports are placed at some disadvantage compared with competing German ports since the thinness of traffic does not allow them to offer the same range of facilities. On the other hand, their geographical proximity gives them a notable cost advantage in the Austrian hinterland, even against the special German railway tariffs designed to draw traffic toward the ports of northern Germany. It is this aspect of the marginal and competitive character of the hinterlands of German and Adriatic ports in Austria which has particular interest and special importance in the present context of European trade alignments. The growth of Austrian trade through Adriatic ports since 1955 and the improvement in shipping services offered at these ports has been outstanding, but it is notable that at Rijeka, Czech and Hungarian trade constitutes the larger part of transit traffic.

The continuing influence of geographical factors in determining the fortunes of these ports during the shifts and changes in boundaries which have occurred in more recent years are well brought out in this paper. In providing a concise, well

documented account of more recent developments the paper makes an excellent contribution to the study of the economic geography of Central Europe and to the frequently neglected study of port geography and functions. H. THURSTON

MONOGRAFIE DER ZEEPOLDERS: a report on the characteristics of the principal soil types of the Belgian "sea polder" area. By L. DE LEENHEER and M. VAN RUYMBEKE. *Ghent: Rijkslandbouwhogeschool*, 1960. $9\frac{1}{2} \times 6$ *inches;* 416 *pages; plates, diagrams, folding maps*

Professor de Leenheer describes in this work the development of procedures for analysing and assessing the productivity of the soils of the Belgian "sea polder" area of marine alluvial soils—a band roughly 10–12 kilometres wide inland from the sea coast. Although the report is written in Flemish a determined British reader will be able to extract a considerable amount of useful information from the English summary, supplemented by the abundant tables and figures of which the meaning of the Flemish headings is usually clear, and the French legends to maps and diagrams.

Briefly, the aim of the work described has been to characterize with regard to their chemical, physical and agronomic properties the soils represented by the mapping units employed in the soil survey of the sea polder region. Details of laboratory techniques are probably of interest only to the professional soil chemist, but geographers could be interested in the work as an illustration of the way in which, by the method of successive approximations, laboratory analyses of soil samples may be used to improve the soil mapping legend, and the results of the survey may be used to improve the sampling procedures, so that the soils analysed may really represent the modal concepts of the mapping units employed.

That soils in the field frequently show continuous and independent variations in several of their more important characters, as a result of independent variation in several of the factors determining the nature of soil-forming processes, is not always fully recognized. It is refreshing to read about a survey, such as that described by Professor de Leenheer, in which the inductive nature of soil mapping units is fully recognized, and the analytical background to the field-work organized accordingly.

P. H. T. BECKETT

ASIA

THE RED SNOWS. By SIR JOHN HUNT and CHRISTOPHER BRASHER. *London: Hutchinson*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 176 *pages; sketch-map and illustrations.* 25*s*

This account of the British Caucasus Expedition of 1958 is essentially for the mountaineer, but the general reader will find much interest in this new aspect of Russian life and in the excellent descriptions of individual Soviet climbers. It needed five years of patience and pertinacity, and the fame of Sir John Hunt, for a party of eight young men to break down official barriers and reach the peaks of the Caucasus. Once there, however, they were well received and had no difficulty in making friends with the young people at the mountain training camps. At first they reacted adversely to the high degree of organization and regimentation they found, but finally admitted that there was something to be said for sensible control of enthusiastic climbers. The Russians had not their up-to-date equipment nor high huts, from which a comfortable start could be made in the mornings, but made good this deficiency by improvisation, Spartan habits and tenacity.

The first objective, the summit of Ushba, was not achieved because of adverse weather conditions, and a week spent on this assault made time unfortunately short for other things. The climbers moved over to the Bezingi Glacier and, dividing into three parties, selected different climbs. One achieved the summit of the second highest mountain in the Caucasus, Shkhara (16,592 ft.), by a route only twice covered previously, and the two strongest climbers, George Band and Mike Harris, made a fine ascent of Dykh-tau by an entirely new route. The Russian reaction was to send their own men immediately to do the same! Preoccupation with climbing seems to have shut the eyes of the young men to the beauty of their surroundings, and this book

would not encourage the less ambitious climber to go there were it not for the words of Sir John Hunt who, in a few telling phrases, reveals the unsurpassed beauty of the remote range.

JOYCE DUNSHEATH

GÉOGRAPHIE HUMAINE DE BEYROUTH. By SAID CHEHABE-ED-DINE. *Beirut, 1960 (obtainable from the author, Basta fawka, rue Saleh Haidar, Beirut).* $9\frac{1}{2} \times 6\frac{1}{2}$ *inches; 410 pages; maps and photographs.* 50*s*

A cheer must greet any Arab author who is interested enough in the geography and history of his home town to write a book about it. All too often in the past only Europeans in the Arab world were attracted to study and record the life of the country around them, while native scholars passed over these domesticities to busy themselves in other fields. Now new generations of Arab scholars, trained in western disciplines, are beginning to interest themselves in local studies. Works on rural or tribal life by local authors are still rare, but the city-dwelling student describing his city and the life of its people is carrying on an ancient Arab tradition which never quite died, although it is still uncommon to find such works conceived and executed in modern terms.

A cheer, then, for Dr. Chehabe-ed-dine's Sorbonne thesis. Hardly three cheers, however. He has collected and set forth a great deal of information about Beirut—indeed, there is almost a street by street description of the city. But the facts are not well arranged or related to each other, and the work would have benefited from severe pruning and editing. There are numerous sketch maps, some so badly drawn and printed as to be almost indecipherable, and about 100 photographs, many of them so reduced and reproduced as to be quite valueless.

There is some good material in the book, for instance on the nineteenth century growth of the city, on the composition of its heterogeneous population and on its commercial functions. There are some admirable interviews with Beirutis of several social classes, and brief studies of common types of house. The work seems to be completely lacking in religious or other prejudice. To the main work on Beirut are added brief chapters on Damascus and Baghdad.

NORMAN N. LEWIS

THE NEW-OLD LAND OF ISRAEL. By NORMAN BENTWICH. *London: Allen and Unwin, 1960.* $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 102 pages; plates.* 18*s*

Professor Bentwich tells the story of the archaeology of Palestine from its beginnings in the early nineteenth century through the discoveries of the Mandate down to the work that has been done since Israel was created. Biblical history is interwoven with modern discoveries and he shows how the spade verifies the written record. Israeli agricultural settlers have played an active part in the 250 excavations that have been made since 1948; the finds have helped to strengthen Israel's sense of communion with its ancient past. As archaeology has grown more scientific the mounds (Tels) in which lie buried cities or villages of antiquity have been uncovered layer by layer, the chronicle being pieced together from bits of wall and foundations, subterranean chambers and tombs, shrines and sculpted images and tablets, sherds, animals' bones and human skeletons.

Palestine was a battleground of civilizations and the story is complex. This is shown in the turbulent history of Jerusalem or at Jericho, where there is evidence of a walled city going back to 8000 B.C. and where there are seventeen town walls dating from the period 3000–2000 B.C.—long before Joshua's victory over the Canaanites. The fortress cities are rich in finds. There is the Philistine stronghold of Gezer, which was a centre of struggle between the Egyptians and the Canaanites, the Philistines and the Hebrews. There is Lachish, which has given a living picture of Egyptian, Canaanite and Hebrew life for a thousand years before the first Captivity. And in Galilee there is Hazor, a principal town of the Canaanites and a strongpoint on the military road between Egypt and the Western Asia Empires. Mr. Bentwich ends with the finding of the Dead Sea Scrolls, which coincided with the restoration of the Jewish State.

This absorbing account would have been easier to follow with a map.

E. G. HANROTT

SOCIAL STATUS AND POWER IN JAVA. By L. H. PALMIER. London School of Economics Monographs on Social Anthropology, No. 20. *London: University of London, The Athlone Press*, 1960. 9×6 *inches;* x+171 *pages; maps.* 30*s*

In this thorough and useful monograph Professor Palmier discusses themes of basic importance in Javanese society, both in its traditional hierarchic form and in the more fluid republican situation. His study is based on two years of research (1951–2, 1953–4) in two towns in central Java: one, small and conservative, of 8000 people; the other, modern, cosmopolitan, and a centre of administration and communication, with a population of 80,000. He therefore possesses an intimate comparative view of different styles and periods of Javanese social life.

The author is particularly interesting in his analysis of the significance of titles of nobility and their transmission, and the functions of primary and secondary marriages in maintaining the cohesion of the ruling class as well as unequal links of kinship with the subordinate classes. Notions of kinship and social class were traditionally of a prime political importance which is now rapidly decreasing, and it is greatly to Palmier's credit to have brought out these features so clearly while there is still time.

No less interesting, however, is his description of the changes being wrought in the old system by the abrupt advent of the new republican officialdom, with administrators appointed from classes previously unentitled to power. As part of this modern situation, too, there is (or was at the time of research) an equally significant factor in the association of the resident Chinese with their economic power, and the Javanese with their social status and the administrative perquisites it accords them.

The account suffers in places from a rather leaden expression of sociological propositions; and it is rather surprising that so scant reference is made to the very extensive Dutch literature on Java, and none at all to Javanese or Indonesian sources. But these are slight defects in a most interesting and uniquely informative study.

RODNEY NEEDHAM

AFRICA

AGRICULTURE AND ECOLOGY IN AFRICA: a study of actual and potential development south of the Sahara. By JOHN PHILLIPS. *London: Faber and Faber*, 1960. 10×6 *inches;* 424 *pages; folding map.* 63*s*

In this important book Professor Phillips assesses the opportunities for development in the emergent countries south of the Sahara in the light of their whole physical, economic and social make-up. Stressing that Africa is neither a reservoir of biotic wealth nor a Cinderella of poverty, he emphasizes the failure of traditional agricultural practices to advance with changes of population density. He directs attention to the hazards of the African environment, as yet little understood, and pleads for an ecological approach in measures for agricultural development and adjustment. His message is directed especially to those countries on the brink of independence, and he points out that relaxation in control over such things as the movement of wild game or the introduction of exotics, may lead to cumulative disaster. He warns of the risks inherent in hasty attempts in agricultural and associated developments and urges the need for pilot surveys and thorough studies of economic and ecological conditions before large-scale ventures are undertaken. Here he explains the lessons of the East African Groundnut Scheme, examines the difficulties encountered on the Gezira Scheme and outlines the planning of the Volta River Project.

The book is in five parts. The first outlines the background to the problems of agricultural and related development. The second deals with the forest bioclimatic regions, and the third with the wooded savanna and related bioclimatic regions. The fourth is a survey of human and animal health and the last is concerned with conclusions and suggestions. Here the author explains the failures of the past, the things that have been neglected, and the things that must be done to ensure that Africa's economy keeps pace with her political advance.

The book has certain shortcomings which are partly related to its wide scope. The

excessive use of letter symbolism in the classification of the bioclimates is irritating and achieves no useful purpose. Apart from one map of the bioclimatic regions, maps and diagrams, much needed for the understanding of the text, are lacking. In places the text becomes a compendium of references. The book, however, is an excellent reference book and contains an extensive bibliography. M. M. COLE

INDIAN PEOPLE IN NATAL. By HILDA KUPER. *Pietermaritzburg: Natal University Press*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 296 pages; plates and diagrams*

Timed to coincide with the celebration of the centenary of the arrival of the first Indians in South Africa, this work is one of the most searching contributions to our knowledge of the Indian community in Natal. Although primarily anthropological, the work will prove valuable also to the human geographer. The writer concentrates upon the Hindu community of Durban which constitutes 74 per cent. of the Indian population of the city. The work is divided into three principal sections. Firstly, the background to the Indian life pattern in South Africa and the emergence of new social stratifications of the population in a process of adaptation to the culture contact between Indians and Europeans is examined; secondly, a detailed study of kinship relationships; and thirdly, public cults and health.

The first section is probably of greatest importance to the geographer. Here the writer traces the breakdown of the traditional caste system and analyses the evolution of a westernized pattern of human relationships. In discarding the caste system the Indian community has evolved a new pattern of "élites" based upon economic (business and professional), social (education, art, entertainment, sport) and political lines. Barred from full participation in the western society of the European, a diversity of associations and semi-public bodies which "are the main units for internal cohesion in a minority group excluded from the central power of the state" have evolved. In these associations the new "élites" have found an outlet for expression.

In a country in which anthropological study has been largely confined to the African society, this work on the Indian community is overdue and will fill a gap in the study of Man in South Africa. The reader will look forward to the promise of a second volume from Hilda Kuper which will treat of the parallels between the South African Indian and other immigrant communities of the Indian Ocean periphery. R. J. DAVIES

ACCRA SURVEY: a social survey of the capital of Ghana. By IONÉ ACQUAH. *London: University of London Press*, 1958. $10 \times 7\frac{1}{2}$ *inches; 176 pages; maps, plates, tables.* 50*s*

THE ALIEN TOWN: patterns of settlement in Busoga, Uganda: an essay in cultural geography. By ANN EVANS LARIMORE. *Chicago: Department of Geography*, 1959. Research Paper No. 25. 9×6 *inches; 208 pages; maps and plates*

LIBREVILLE: LA VILLE ET SA RÉGION (Gabon—A.E.F.) Étude de géographie humaine. By GUY LASSERRE. *Paris: Librairie Armand Colin* (*Cahiers de la Fondation Nationale des Sciences Politiques*, 98), 1958. $9\frac{1}{4} \times 6$ *inches; 347 pages; maps and plates*

These three books are welcome additions to the still scanty literature on tropical African towns about which so much has been said, but relatively little written, in recent years. They are largely concerned with three towns, for Miss Larimore, though dealing with patterns of settlement throughout Busoga, devotes much of her space to the town of Jinja that is developing alongside the Owen Falls Dam. The towns have broad similarities, along with some striking differences. Two of them are almost on the Equator, and Accra is only 5 degrees north. All three are in predominantly agricultural areas, each of which also produces at least one commodity for which there is a world demand—cocoa in Ghana, *okoumé* timber in Gabon, and cotton and now copper (as well as hydro-electricity) in Uganda. They are all growing rapidly, drawing into them people from rural areas, and in the process creating a whole range of new social and economic problems. Yet between them there are important differences—in age, history, size and present circumstances. Jinja is, in every sense, a "new town," a creation

of mid-twentieth century industrialization and urbanization—an example, in Miss Larimore's words, of "the type of multi-cultural city developed by European and Indian enterprise and investment implementing Western standards of life;" its population may exceed 60,000 within a decade. Libreville, though established only in 1850, is very much an "old town" in the essentially young country known until recently as French Equatorial Africa; there are, however, only 18,000 people in the predominantly European "ville," though many thousands of Africans live in the adjoining "village" suburbs. Accra was founded by the Dutch in 1650 and became the capital of the British Gold Coast in 1877; yet today, in its active life, its modern buildings and its tremendous expansion (it has nearly 200,000 inhabitants, nearly all Africans), it is very much a symbol of the political confidence and economic progress of the new Ghana.

A review of three books can indicate only a selection of the features that are of particular interest to geographers. The late Mrs. Acquah, the English wife of a Ghanaian civil servant, was a sociologist whose 'Accra Survey' is complementary to K. A. Busia's 'Social Survey of Sekondi-Takoradi' (1950). She has produced a painstaking, objective and comprehensive statement of the functions and services of modern Accra; the work was based on extensive field-work and is supported by 108 statistical tables. Apart from chapters on housing, economic life, government, religion and education, there is a useful analysis of the composition of the population and a valuable account of the town's historical and geographical background; for the latter the author acknowledges her debt to an unpublished paper by J. H. Hubbard, formerly of the Department of Geography in the University College of Ghana. Especially interesting are four maps showing the size and lay-out of Accra in 1826, 1903, 1934 and 1952; colour might have been used to advantage in the last of these maps in which fifteen categories of land use are distinguished.

Miss Larimore's study based, like Mrs. Acquah's, on extensive field investigations, is an American doctoral thesis that owes much to the inspiration of R. S. Platt. It seeks to establish the influence of alien traditions of settlement as a result of the immigration of new cultural groups. Europeans, Asians, Arabs, immigrant Africans and indigenous Africans are all considered, special attention being directed to Jinja with its markedly alien character and to the effects of trading centres (mostly Indian) in the rural areas. It would be idle to pretend that it is an easy book to read; the meaning of sentences is often hard to follow, and many terms and phrases are used that are neither typically American nor, fortunately, characteristic of human geography. Thus, in contrast to the one- or two-word chapter headings in Mrs. Acquah's straightforward survey of Accra, Miss Larimore has, as two of her chapter titles, "The dispersion of focal units of occupance in the areal functional organization of Busoga" and "Processes of change in the spatial organization of aboriginal Busoga."

M. Lasserre's book on Libreville is an analysis of a town in its regional setting, with such sociological aspects as are considered at any length left until after a full discussion of Libreville's physical environment and economic basis. As its sub-title rightly indicates, it is much more than urban geography—it is a real study in human geography that proceeds from the immediate urban landscape to the estuary and then to Gabon as a whole, with frequent references to the links, in modern times, between port and hinterland and town and country. The chapters on population deal in some detail with the make-up and demographic structure of the community, with an emphasis on the contrast between the stabilized and unstabilized settlements surrounding the town proper. Towards the end, the book touches on socio-economic matters such as those studied in Accra in much greater detail, and something is said of the effects of contact between "Occidentalisme et Africanisme," between white and black civilizations. Here M. Lasserre realizes that he is dealing with problems common to all African towns that have developed through European contact, colonization and commerce, and admits that they take us far beyond what he terms "the traditional paths of geography." He makes a plea, that one feels bound to re-echo, for inter-disciplinary collaboration. What is needed are more books of the type and calibre of the three reviewed here and

which reflect in so interesting a manner the diversity of personality, the differences in training, and perhaps the divergence in national attitudes of a British sociologist, an American human geographer, and a French professor of tropical geography.

R. W. STEEL

ETHIOPIA. By JEAN DORESSE. Translated from the French by Elsa Coult. *London: Elek Books*, 1960. $9\frac{1}{2} \times 6$ *inches; 239 pages; maps and plates.* 35*s*

EGYPTIAN ART: an introduction. By BORIS DE RACHEWILTZ. Translated by R. H. Boothroyd. *London: Hutchinson*, 1960. 8×5 *inches; 256 pages; plates and line-drawings.* 40*s*

These books are concerned with two countries in which, more than most, geography provides the key to problems of cultural development. Ethiopia has been aptly described as a museum of peoples, languages and faiths and M. Doresse, former head of the Imperial Ethiopian Government's archaeological department, gives a very readable account of its chequered and divided cultural history down to the present day, ending with a bird's eye view of the country and the people. The book, excellently illustrated but with only one, and quite inadequate, sketch-map, is meant for the layman. Nevertheless it includes, in this translation from the French edition of 1956, much fresh information now published for the first time in English. It is well worth reading not only by intending travellers to a country in parts still as exciting (and as difficult) to discover as it was in the days of Prester John, but also by geographers looking for a largely untouched field for scientific exploration.

M. Rachewiltz's book is of less geographical interest, being mainly concerned to explain the apparent lack of any fundamental evolution in the development of ancient Egyptian art. Nevertheless, geography comes in since it so greatly contributed to the unity, self-containment and isolation of the Egyptians, thus affecting their psychological outlook in art as in much else. A final chapter contains a summary, useful to historians, of the results of C.14 radioactive carbon methods when applied to established chronologies. A thoughtful book, attractively illustrated, and very well translated out of the Italian.

L. P. KIRWAN

THE EROSION OF VICTORIA BEACH: its cause and cure. By J. E. WEBB. *Ibadan University Press*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 42 pages; maps, diagrams, plates*

This excursion into the realm of geomorphology by the Professor of Zoology at Ibadan University College will be of interest to all those concerned with coastal changes. The study arose as a result of ecological investigations in which it became necessary to understand the formation and changes of the muddy and sandy deposits which floor the lagoons and front the coasts near Lagos. These however could only be understood by a knowledge of how the lagoons themselves came to be formed, and the research which this necessitated has produced data which Professor Webb suggests will be of value in solving the problem of coast erosion on Victoria Beach east of the entrance to Lagos harbour. This problem is an interesting example of how "protective" harbour installations may have deleterious effects if introduced by man without full knowledge of the processes of nature at work in the area. There is a dominant drift of material from west to east along the Nigerian coast and the construction of extensive moles at the entrance to Lagos harbour has led to the accumulation of great quantities of material at Lighthouse Beach to the west and corresponding erosion on Victoria Beach to the east. Material moved eastwards from Victoria Beach is no longer being replenished and the mole on this side of the harbour entrance has had to be extended *landwards*!

Professor Webb suggests the construction of an outer mole with sand pumping apparatus to encourage the growth of a new sand bar which would protect what is left of Victoria Beach. The problem of Victoria Beach and the solution put forward by Professor Webb would no doubt be very amenable to a controlled laboratory experiment. One hopes that this approach will also be tried before any further large-scale engineering expenditure is incurred.

W. G. V. BALCHIN

NORTH AND SOUTH AMERICA

THIS SCULPTURED EARTH: the landscape of America. By JOHN A. SHIMER. *New York: Columbia University Press; London: Oxford University Press*, 1960. $9\frac{1}{2}\times7$ *inches; 255 pages; maps, illustrations and diagrams.* 60s

The United States, with its great canyons, deserts, plateaus, plains and mountains, has some of the most beautiful, remarkable and spectacular scenery in the world. Even the conventional hardened American tourist cannot help pausing to wonder why this is so, when confronted with such features as Rainbow Bridge, the Petrified Forest, Crater Lake, the Yosemite Valley and the Grand Canyon.

In 'This sculptured earth' John A. Shimer sets out to provide the answers to the questions on landscape formation that inevitably arise when one is touring America. His book, however, is not a textbook of geomorphology; it is written in easy essay form with a minimum of technicalities. There are ten chapters, most of which take a topic broadly related to one of the geological provinces of the United States. The effect of past orogenic and volcanic activity, the work of glaciation and Tertiary river erosion, and more recent coastal changes, are described in general terms illustrated both photographically and in the text with examples largely drawn from the National Parks of the U.S.A. For those who have undertaken a North American tour the book will bring back pleasant memories and will doubtless also supply the answers to most of the morphological questions prompted by this unique and fascinating part of the world; for those yet to make such a tour the book will be of assistance in guiding them to the more spectacular elements of the North American landscape.

W. G. V. BALCHIN

THE CENTRAL DESERT OF BAJA CALIFORNIA: demography and ecology. By HOMER ASCHMANN. *Berkeley and Los Angeles: University of California Press*, 1959. 9×6 *inches;* x+315 *pages. Maps, tables, plates.* $5.00

Within historic times, the central desert of Baja California has experienced the sequent occupance of three groups of peoples, each with a different technology, each making contrasting uses of the natural resources, and each espousing a distinct set of cultural values. First there were the aboriginal Indians, practising a collecting, hunting and fishing economy, and flexibly organized in small and mobile social units. Then came the missionaries, who replaced the former settlement pattern with large, rigid and permanent communities, and who enforced upon the natives a new economy of animal husbandry, the cultivation of crops and the import of foodstuffs from as far afield as the Mexican mainland. Finally, with the collapse of the missions and the gradual extinction of the Indian people, there came the Mexican occupance which has continued to the present day; with it the inhabitants of the desert became yet further concentrated in a few irrigated agricultural settlements, and there evolved an economy based upon marginal cattle ranching and supplemented by the occasional exploitation of some of the mineral deposits to be found there. In the early eighteenth century the Jesuits, exploring the land and establishing their missions, found a population of some 21,000: today the permanent population is estimated at a mere 3500.

This contrast between the current emptiness of the region and the intensity of the former occupance raises certain questions and problems, and it is to these that Mr. Aschmann addresses himself. He has offered us a most fascinating and readable account. After a preliminary report on the physical character of the desert, the author —using the written records of the early explorers and missionaries in the main, but also making some use of the archaeological evidence—seeks to resolve the ecology of the aboriginal Indians, and then to reconstruct their demography. He next moves on to consider the fate of these Indians and their economy, and particularly to understand the reasons for the devastating effect of the many diseases, especially pandemic syphilis, to which they succumbed. And he concludes with a very brief epilogue on the 150 years of Mexican occupance. The questions which the author asks are significant, the answers are thorough, his techniques are skilful, and the approach is geographical.

This is a book which, having the distinct impress of Sauer and Berkeley, well merits the attention of the human geographer and demographer alike. GERALD MANNERS

THE POPULATION OF CENTRAL MEXICO IN 1548: an analysis of the *Suma de visitas de pueblos*. By WOODROW BORAH and S. F. COOK. Series Ibero-Americana, No. 43. *Berkeley and Los Angeles: University of California Press*, 1960. 9×6 *inches; 215 pages; folding maps*

The *Suma de visitas de pueblos* contains descriptions of some 1200 principal towns or *cabeceras* in Central Mexico about the year 1548. It is an important, if perplexing, source of population data, and Professors Borah and Cook analyse it with great skill and thoroughness. The result is a valuable joint monograph in a series well known to students of Middle America.

A review of the prevailing tribute schedules (Chapter II) reveals that more than half had been fixed in the early 1530's and were often hopelessly unrealistic. The *Suma*, based for the most part on personal inspections and written reports, permitted proper adjustments to be made. The non-tributary population was generally outside its scope, and in Chapter IV the authors consider evidence of the relative size of the exempt groups. Moreover, even the tributary population is not reported in uniform terms: the various statements must be converted into comparable units (Chapter V). This done, it is possible to estimate the total population of Central Mexico (New Spain including Nueva Galicia) *c.* 1548. In round numbers this is put at 7,800,000 or about a million more than that suggested by Cook and Simpson in an earlier number of *Ibero-Americana*, *i.e.* 6,427,466 exclusive of Nueva Galicia ("The population of Central Mexico in the sixteenth century,' 1948).

Many of the data analysed in the present essay are clearly set out in tabular form, and the appendices include a synopsis of the *visitas* in the *Suma*. Their territorial extent is shown on four maps. These might conveniently have been combined and given a scale. Otherwise, the production is first-class. R. A. DONKIN

LAND IN BRITISH HONDURAS, Report of the British Honduras Land Use Survey Team. Edited by D. H. ROMNEY. Colonial Research Publication No. 24. *London: H.M.S.O.* 1959 (1960) 9×6 *inches; 327 pages; portfolio of maps*. 55*s*

This report summarizes the work of the Land Use Survey Team in British Honduras in 1952–4. It is encyclopaedic in scope, and in the absence of almost any other published work on the geography of the colony, it will long remain an invaluable source-book. The survey begins with chapters on "basic patterns that will influence land use"—topography, climate, geology, population. An interesting section on geomorphology is based on the work of Dr. C. G. Dixon, and the chapter on vegetation closely follows Dr. J. S. Beard's ideas on the evolution of tropical grasslands, while also recognizing the likelihood of selective preservation of such fire-resisting species as *cohune* palm through centuries of *milpa* agriculture. The core of the book consists of a detailed survey of soil types, forming a commentary on a 1:125,000 soil map in two sheets, which accompanies the report. Data on soils and present land use, from field traverses and aerial photographs, is used to suggest optimum usage for particular soil types. Part Three is in many ways the most informative of all, beginning with an historical outline of land use, and going on to describe in detail twenty-five land use regions. Each description follows the same pattern: climate, landscape, people, land use situation at the time of the survey, and suggestions for improvement. The boundaries of the regions are shown on the 1:125,000 Potential Land Use sheets, but a smaller map showing only these boundaries would have been an advantage. The Report includes appendices on vegetation, soils, Maya agriculture and specific and local names of plants and animals.

Both the Report and the maps are well produced. The small maps included in the Report itself are themselves significant additions to published information, notably those of expropriated land and distribution of Maya remains. More of the information, such as the land use statistics in Table 11, might well have been illustrated

cartographically. There is a brief yet adequate index, but apart from the frontispiece no photographs. Even so the book is a model for similar surveys. It is unfortunate that six years have elapsed between the conclusion of the survey and the publication of its report. Thus action has already been taken on several of the points raised: the immigration of Mennonite farmers from Mexico to supplement the deficient population is a case in point. Nevertheless, this report will provide a sound basis for all future work. 'Land in British Honduras' is an agenda for research, and as such is indispensable.

D. R. STODDART

A SHORT INTRODUCTION TO THE ECONOMY OF LATIN AMERICA. By F. BENHAM and H. A. HOLLEY. *London: Oxford University Press for the Royal Institute of International Affairs*, 1960. 8 × 5¼ *inches;* 169 *pages; maps.* 18*s*

The latest monograph in the Chatham House series dealing with Latin America provides a most useful summary of recent economic development. Designed as a first introduction for the visitor to Latin America and for the reader who intends to study the subject more intensively, the work is surprisingly comprehensive despite its brevity. In Part I, Professor Benham outlines the general characteristics of the continent's population, agriculture, forest and mineral resources, transport and power facilities, manufacturing industries and commerce. Except for the chapter on minerals this section avoids being merely a series of lists; thus, for example, the chapter on agriculture touches upon the problems of irrigation, soil erosion and agrarian reform. In assessing future prospects Benham adopts the orthodox viewpoint, stressing the desirability of a stable currency, a balanced foreign trade and a welcome to foreign investment.

Part II, by H. A. Holley, is devoted to a most valuable examination of post-war trends in each of the seven leading republics: Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela. Economic developments are explained in the light of changes in world conditions and in government policies. The book concludes with a statistical appendix but no bibliography. In view of its aim this is an unfortunate omission, since the sources most frequently used are United Nations agencies' reports which themselves usually lack bibliographical guidance. The reader may, however, rectify the omission by consulting the economic sections of the companion volume, 'Latin American history: a guide to the literature in English' by R. A. Humphreys (R.I.I.A. Oxford, 1958). The five over-simplified maps must also be supplemented from other sources.

J. COLIN CROSSLEY

THE HEART OF THE FOREST. By ADRIAN COWELL. *London: Victor Gollancz*, 1960. 8½ × 5½ *inches;* 256 *pages; maps and plates.* 25*s*

The pace of development in Brazil is one of the phenomena of Latin America. An entirely new capital is being built at the edge of the jungle, and yet within a few hours' flying one can be over forest believed to contain Indian tribes never yet reached by "civilizados." The pressure of progress is inescapable and relentless, the aeroplane has reduced the effectiveness of the jungle as a barrier, and territory upon which no one has yet set foot is already subject to commercial speculation. Fortunately, Brazil has produced many concerned for the welfare of the Indian, recognizing not only the threat to his way of life, but also to his very existence. The Indian Protection Service, and notably the brothers Villas Boas, provides the Indian with hope, even if limited, for the future.

Adrian Cowell joined the Villas Boas's camp on the upper reaches of the Xingu in the Mato Grosso. The Boas's task was to prepare the tribes of this area, still closed to exploitation, for contact with civilization. They had also, to satisfy a governmental whim, to make an expedition to the geographical centre of Brazil, involving a traverse of forest containing a nomadic tribe of uncertain friendliness. 'The heart of the forest' describes the comings and goings at the base camp, hunting with Indians, and the expedition to the "centro geográfico." It is an account noteworthy for its attempt to penetrate the thinking of the Indians, and their attitude to killing, sickness and death.

"Jungle sickness," the mental apathy that comes with a prolonged stay in the jungle, when the human being becomes just another of the multitude of living forms it supports, is perhaps the normal state of the Indian in his circumscribed environment. The conclusion is a depressing one. The Indians will ultimately become extinct; all that the Villas Boas's can do, and this they know, is to soften the impact of civilization and alleviate the distress of a disappearing people.

The two maps included are annoyingly inadequate. The photographs are attractive and often informative, but that of Machu Picchu is hardly relevant to the subject matter.

PETER BELL

AUSTRALASIA

THE PHYSIOGRAPHY OF VICTORIA: an introduction to geomorphology. By E. SHERBON HILLS. *Melbourne: Whitcomb and Tombes*, 1959. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 292 *pages; maps and plates*

Professor Hills's 'Physiography of Victoria' first appeared in 1940, when it formed a brilliant introduction to the study of the land forms of Victoria. The present edition has endeavoured to incorporate some up-to-date information and in one or two places new diagrams replace older ones; part of chapter 14 has been rewritten. This edition is also produced on better paper than the earlier ones, with the result that the diagrams and photographs are reproduced much more clearly. The book still remains a very useful introduction to many aspects of Victoria's physiography; it is perhaps the claim in its sub-title which will worry an English reader. Geomorphology has developed in Europe so much since 1940 that the revision of the book now presents Professor Hills with serious problems. It is difficult to see how he can incorporate modern work in climatic geomorphology and on physiographical processes without radical rewriting. The parts of the book dealing with the interrelations of the geological structure and the land forms have, as one would expect, stood the test of time; but in those parts dealing with "climatic accidents," as they were once called, it is hard not to feel that the book is now outdated. Many topics such as slope retreat and periglaciation, which have become a vital part of present day discussions in geomorphology, are hardly alluded to, if at all. Such omissions are important because many of the land forms of Victoria will probably be found to be the result of the varied processes now being studied by climatic geomorphologists; this is particularly true of the land forms in the Victorian Highlands.

This book, when it was first produced, was a "classic;" new developments in geomorphology are changing its usefulness. All students of Australian land forms will still find the book invaluable, but it should be pointed out that many of the questions which concern geomorphologists today, both in Victoria and elsewhere, are not mentioned.

M. M. SWEETING

GREAT DAYS IN NEW ZEALAND EXPLORATION. By JOHN PASCOE. *London: Bailey Bros. & Swinfen*, 1959. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 192 *pages; maps and plates.* 21*s*

EARLY TRAVELLERS IN NEW ZEALAND. Edited by NANCY M. TAYLOR. *London: Oxford University Press*, 1959. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xxxii+594 *pages; maps.* 63*s*

The author of the first of these books, a noted New Zealand traveller, is well qualified to describe the fascinating story of exploration in that country, since he has himself covered much of the ground discussed and, in the remoter areas, under conditions not dissimilar from those encountered by the pioneers, where bush and rain still dominate. Each of the eighteen chapters is devoted to the journeys of one particular explorer; although their reasons for exploring were very diverse, ranging from religious motives to gold-seeking and surveying, the common contribution of these men was the discovery of new routes and new country. The bush-craft of the Maoris accompanying the explorers, both in North Island and on Brunner's journey in the South, is fully appreciated. Good photographs illustrate the natural difficulties and variety of terrain, while maps enable the routes to be followed. The book, which is derived from

original sources, gives a vivid picture of early New Zealand and can be well recommended.

A wide variety of country and conditions are dealt with by the eleven travellers whose accounts are reproduced in the more substantial book edited by Mrs. Taylor. Together they give an arresting picture of the early life in a young country, from the visitations of the first Bishop of New Zealand to the severe hardships suffered by Barrington in his search for gold in the remote mountains of Otago. Seven of the journeys took place in North Island and these in particular throw much light on the changing attitude of the Maoris to the new settlers. There is a striking contrast between the ready acceptance of Christianity recorded by Bishop Selwyn and the narrow escape of Meade at the hands of the Hau-Hau tribe. The travellers give vivid pictures of the scenery through which they pass, the flora in particular being described in detail by Colenso. The scenic wonders of the Volcanic Plateau struck the early explorers with particular force and, as six of them visited this area, it receives perhaps rather undue attention, although early descriptions of the pink and white terraces in Lake Rotomahana are of value owing to their destruction by the eruption of Tarawera in 1886.

The value of the book is greatly enhanced by Mrs. Taylor's scholarly editing. Each contribution is introduced by a brief biographical sketch, maps enable most of the journeys to be followed and there is a glossary of native plants and birds. The accounts, which are written from varying standpoints and in differing literary styles, reveal the character of the travellers themselves as effectively as they describe the physical scene. Just as the well known 'Letters' of Charlotte Godley afford an intimate view of social life in early New Zealand, so this book provides an absorbing and authoritative description of the country itself by those who, as Europeans, penetrated much of it for the first time. C. A. M. KING and K. C. EDWARDS

SOCIAL CHANGE IN TIKOPIA. By RAYMOND FIRTH. *London: Allen and Unwin*, 1959. 9×6 *inches;* 360 *pages; sketch-maps, illustrations.* 45*s*

ECONOMICS OF THE NEW ZEALAND MAORI. By RAYMOND FIRTH. Second edition of PRIMITIVE ECONOMICS OF THE NEW ZEALAND MAORI. *Wellington, N.Z.: Government Printer*, 1959. 9½×6 *inches;* 519 *pages; map, plans, illustrations.* 50*s*

The analysis of social change offers some of the most refractory problems in the social sciences. Viewed broadly, they have readily yielded generalizations which are worth very little. Viewed narrowly, they have produced detailed studies which do not bear on the same hypotheses. As a consequence there is as yet no satisfactory body of social change theory, but we now know that the construction of it is an arduous task leading to a complex goal. False starts towards this goal have been legion, but one of the more consistently fruitful approaches is made by the anthropologist who has a single society in front of him and a number of relevant hypotheses in his mind.

In 'Social change in Tikopia,' Professor Firth takes some major steps towards bridging the gap between the generalization and the fact of social change. The book is an intricately detailed account of post-war life in this already famous Polynesian society, and is presented as the raw material for some searching inquiries into the nature of change. It results from a re-study in 1952–3 of the island first studied by the author in 1928–9; the purpose of the second visit was to infer processes of social change from the differences and the sequences which had led to them.

This unusual control of fact allows Professor Firth to try out the complementary concepts of social structure and social organization as analytic devices. At times the Tikopia with an abrupt shift have changed the very nature of their social system; continuously the operations of their life alter, perhaps presaging the eventual structural change. The meticulous examination of these alterations of organization and structure in kinship, politics, religion, social control and economic life marks a significant advance in the observation and analysis of change.

Anthropologists have found it is seldom useful to see the determinants of social life as distinctly separated into external and internal influences and, in keeping with this,

much of the analysis centres on Tikopian perception and evaluation of new possibilities in their environment and society and we are led to an intimate understanding of the choices and decisions they make. While Professor Firth is not optimistic about the ability of the social sciences to offer a forecast of the future of a society except as a statement of some of the alternatives which lie ahead, many of the discussions, notably those on the economy and the political system, are models of how to expound the possibilities in store for a small society about which a great deal is known. Two sections of the book offer rarities: an account of the introduction of money into a primitive economy, and an account of the reaction of the society to the famine which followed two hurricanes. 'Social change in Tikopia' is not easy to read. The author has supplied a mountain of fact so that the reader may follow the analysis and accept or controvert it, and his fluent style is needed in order to make it at all manageable.

The second book, inherently a simpler one, is a delight to read. Long out of print and almost impossible to get, 'Economics of the New Zealand Maori' has been provided with new introductory and final chapters and handsomely re-issued. This is the book which, published in 1929 as the author's doctoral thesis, took its place alongside Malinowski's 'Argonauts of the Western Pacific' as an analysis of the social relationships of an economy. Its one defect, which grew over the years, was its introductory discussion of points of economic theory which became dated, and in any case were raised more for the examiners than for other readers. The section has been replaced by an admirably succinct outline of economic anthropology. And an interesting final chapter has been added on Maori social and economic change. H. HAWTHORN

ANTHROPOLOGY IN THE SOUTH SEAS: Essays presented to H. D. Skinner. Edited by J. D. FREEMAN and W. R. GEDDES. *New Plymouth, N.Z.: Thomas Avery and Sons*, 1959. $10\frac{1}{4} \times 7\frac{1}{4}$ *inches; 267 pages; plates and diagrams.* 42*s*

H. D. Skinner is a senior scholar whose Polynesian researches form a just claim to recognition. This volume of essays pays tribute to Dr. Skinner also as a teacher who, from his posts with the Otago Museum and the University of Otago, influenced a good number of those who are now working in the anthropology of the South Seas. A book of this kind presents problems of theme and organization. The title suggests the solution chosen for the volume; beyond that there is no attempt at coordination but the high quality of the various essays ensures its value for anyone interested in the populations and cultures of the region. Articles are contributed by Leslie Lockerbie; T. T. Barrow; Raymond Firth; Catherine Berndt; John Booth; Jack Golson, on criteria for an analysis of New Zealand pre-history; Roger Duff, on adze typology in Eastern Polynesia; J. D. Freeman, on an early cargo cult in Samoa; W. R. Geddes, on changing Fijian social structure; W. D. Borrie, on some of the implications of the rapid expansion of the Maori population; and Angus Ross, on the racial argument once used in support of New Zealand's political interests in the Pacific. H. HAWTHORN

POLAR

FRANCE ET L'EXPLORATION POLAIRE: de Verrazano à La Pérouse, 1523–1788. By MARTHE EMMANUEL. *Paris: Nouvelles Éditions Latines*, 1959. $9 \times 5\frac{1}{2}$ *inches; 397 pages; maps, plates*

This is the first of two volumes devoted to the history of French polar exploration. Appropriately, it is dedicated to the late J.-B. Charcot whose initiative and enterprise in the face of official apathy awakened his country's interest in the Arctic and Antarctic and whose tradition of scientific integrity has been so well upheld by P.-E. Victor in recent times. For France's interest in the far North and South has for the most part been expressed through individual initiative. Throughout French history official support has tended to be at the best lukewarm; Henri IV's interest in the North-east Passage and Louis XVI's support of La Pérouse were notable exceptions. In this volume Dr. Emmanuel shows how during the great colonial period of the sixteenth, seventeenth and eighteenth centuries France failed to grasp the opportunities

which so often presented themselves to rival Britain as a "Polar" power. Practical experience in the Arctic and sub-Antarctic was left to waste; in particular, geographical theories, of which there were no lack, were seldom put to the empirical test. Thus, in Canada, the myth of a trans-continental waterway linking Hudson Bay with the Pacific inhibited French penetration into the true Arctic.

Dr. Emmanuel has succeeded admirably not only in chronicling this less known epoch of Polar history but also in demonstrating the various influences which determined the direction taken by France in this field—religious mysticism, commercial aggrandizement, scientific enlightenment. It is to be hoped that the second volume will contain legible maps; the reproduction of those in the first is execrable.

H. G. R. KING

UNGAVA BAY PAPERS: Scientific results of the Oxford University Hudson Strait Expedition, 1931. *London: Oxford University Press, for the Oxford University Exploration Club*, 1960. *Reprints of 22 papers in covers* 11 × 7½ *inches; illustrated.* 50*s*

The Oxford University Hudson Strait Expedition of 1931 published its scientific findings in a number of journals during the years 1932–8. These have now been collected in the form of reprints and issued under one cover by the Oxford University Press. The expedition of eleven members was led by H. M. Clutterbuck, and received support from Oxford University, Christ Church and Magdalen College, the Royal Geographical Society and the Royal Society; the parents of Christopher D'Aeth, who died on the expedition, the late Rev. F. G. D'Aeth and Mrs. D'Aeth, contributed generously to the cost of the present publication.

The first paper in this valuable collection is the lecture delivered to the Society by H. M. Clutterbuck on 8 February 1932, and published in the *Geographical Journal* for September 1932 (Vol. **80**, pp. 211–33). Clutterbuck, who died in 1941, was an experienced explorer, having been in Spitsbergen with Oxford expeditions in 1923 and 1924. Akpatok Island, on which the 1932 party concentrated their researches, was scientifically almost unknown when they went there and proved an interesting area for ecological and geological study. The papers, covering a very wide field of research, have been assembled and seen through the press by Charles Elton, described in the brief preface as the Expedition Editor.

DOROTHY MIDDLETON

ANTARCTICA: THE STORY OF A CONTINENT. By FRANK DEBENHAM. *London: Herbert Jenkins*, 1959. 8¾ × 5½ *inches; 264 pages; maps and plates.* 25*s*

The author's experience as geologist on Scott's last expedition and as the first director of the Scott Polar Research Institute has enabled him to write a book on Antarctica with an authority which none can surpass. His alert mind, more concerned with the future than the past, and his fluent style of writing have given us a book attuned to the modern outlook and eminently readable. Professor Debenham gives us an excellent survey of men's speculations on the existence of a southern continent from classical times to the time of James Cook. We learn that Polynesian sailors of the seventeenth century may actually have been the first to sight Antarctic ice. The net result of Cook's second voyage was "a series of negatives," but the reports of seals which he brought back led to their exploitation, and so fortuitously to the first discovery of land south of the Falkland Islands. But the work of the sealers was checked by their own ruthlessness. While men turned to the Arctic with its promise of a north-west passage and its whaling and sealing prospects, in the Antarctic there was for more than fifty years a lull in exploratory voyages after the national expeditions led by Wilkes, d'Urville and Ross in the mid-nineteenth century. When he comes to the "heroic age" of Antarctic exploration, a phrase which he modestly discounts, Professor Debenham eschews comparisons between the great captains, Scott, Shackleton and Amundsen, but prefers "emphasizing what they did and omitting what they left undone"—a sentiment which will receive general sympathy from his readers.

His "story of a continent" takes us on to the International Geophysical Year with a very sound appreciation of the potential of aircraft and mechanized ground trans-

port. There is no nostalgia here for the old ways, unless it is nostalgic to be glad that "both the Poles were reached . . . by the efforts of man and dog only." Moreover, Professor Debenham is undoubtedly right when he suggests that, for some purposes involving travel in mountainous and crevassed country, dogs are still superior to vehicles. The reviewer has one criticism of this part of the book: there is no mention of the outstanding work of the Australian National Antarctic Research Expeditions other than a passing reference to the A.N.A.R.E. base at Mawson. The chapters on weather, glaciology, wild life and the ocean are admirably clear and simple in style for the general reader. Useful lessons are drawn from different field methods and from the reactions of men to the Antarctic. Though times have changed, the dangers today are just as real and more is hazarded in men and material than of old. The leader's responsibilities are greater than ever, and the harsh glare of publicity through radio and press throws an added strain. It is early yet to make an assessment of I.G.Y. work in the Antarctic, but the author sees Antarctica mainly as a scientific playground for a long time to come. Eventually the continent might be used as a sanatorium or a huge deep-freeze for the world's surplus food. Such possible developments seem much less remote to us today than present developments would have appeared to the author fifty years ago.

As might be expected, there are remarkably few errors or misprints in the book, but that such may be corrected in a second edition the reviewer would mention the following. Elephant Island is referred to the South Orkney rather than to the South Shetland Islands; the British Graham Land expedition 1934–7 is described as the first British expedition to winter in the Antarctic for twenty years, although on another page the British wintering on Graham Land in 1921 is recalled; and Scott wrote in one of his last letters "I fear we have shipped up" in the nautical phrase, not "slipped up." The photographs are excellent, and there is a foreword by Sir Vivian Fuchs.

There runs through the book a sense of high endeavour and a strand of poetic and artistic feeling which must not be lost by future explorers "though they mount to the stars on wings."

G. HATTERSLEY SMITH

NORTHWEST TO FORTUNE. By VILHJALMUR STEFANSSON. *London: George Allen and Unwin*, 1960. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches; 356 pages; maps.* 30*s*

During his long career as an anthropologist and explorer, Vilhjalmur Stefansson has published twenty-four books, and never a dull or worthless one. His newest is well up to his usual standard, though he would certainly deny that, at eighty years of age, there was anything remarkable about this. The purpose is stated in the sub-title, "The search of Western man for a commercially practical route to the Far East," and the bulk of the book covers journeys by sea and land made between the fifteenth and nineteenth centuries. A final chapter introduces air routes, and too late for more than a mention in the introduction is the news of the under-ice crossing of the Arctic basin by U.S.S. *Nautilus* in 1958. Mr. Stefansson divides this material into the search for three passages, North, North-east and North-west. The first two, and the search for the sea route of the third, are covered in the early part of the book; in the remaining three-quarters he is at his best describing the pursuit of overland routes across Canada and Alaska which, first inspired by the fur trade, continued for three hundred years—ending in an engaging wild-cat scheme to build a railway across the Bering Strait. They were great journeys and left a legacy of great names—Hearne, Mackenzie, Bell, Murray, McDougall—and a host of lesser-known ones whose exploits are hardly less memorable. Mr. Stefansson gathers them in from history and near-oblivion, telling their stories with spirit and in perspective, and leaves us once more in his debt.

L. M. FORBES

CARTOGRAPHICAL AND MATHEMATICAL GEOGRAPHY

SUBSURFACE MAPPING. By MARGARET S. BISHOP. *London and New York: John Wiley*, 1960. 9 × 6 *inches; 198 pages; text-figures.* 46*s*

A considerable part of the geological fraternity in North America earns its living by

making the most, or at least as much as possible, out of evidence collected from boreholes. This is true in many enterprises but it applies particularly to those concerned with the study of oil-fields. Exploitation geologists have to assemble and display diverse data and their task is helped by the establishment of a routine for scrutiny and record. This book by Dr. Bishop is concerned with the latter, describing and explaining ways in which maps and sections may help to do this. The text provides many examples and makes suggestions about the use of maps in assisting to solve oil-field problems. Besides the topographical and surface geological maps, to which field geologists in this country are well accustomed, many others are added. Structure maps show the behaviour of the surface of some chosen bed by the contours drawn upon it. Lateral variation of any stratum, how it thickens or thins, can also be displayed by a kind of contouring, the product being an isopach map. If the composition of a formation changes across country, this too may be plotted on a map to exhibit the disposition of facies, for example, the arrangement of sandstone, shale and limestone as they existed together on the surface at a given time in geological history. The electrical properties of beds pierced during drilling have been measured as a matter of routine in most oil-fields during the last three decades and details from such results furnish other sections and maps. Magnetic and gravity variations are also treated in this way. In the last ten years means of detecting traces of significant chemicals in the soil or sub-soil has added still another subject fit for cataloguing on maps. With so many variables to keep in mind the geologist may hope that his file of maps may help towards "a simplicity of presentation" and that after his considerable endeavour his "results may be understood."

J. V. HARRISON

PHYSICAL AND HISTORICAL GEOGRAPHY

THE ATMOSPHERE AND THE SEA IN MOTION: The Rossby Memorial Volume. Edited by BERT BOLIN. *London: Oxford University Press*, 1960. $10\frac{1}{2} \times 7\frac{1}{2}$ *inches;* 509 *pages; plates and diagrams.* 105*s*

This volume is dedicated to the memory of Professor C.-G. Rossby. Fortunately for posterity, during the few months preceding his death, Professor Rossby completed an essay in which he reviewed the achievements of recent meteorological and oceanographical research and gave stimulating indications of ways in which some resistant geophysical problems might be approached. The first fifty pages of the volume are devoted to a translation of this essay, and the remainder comprises thirty-six papers, almost entirely by former students and colleagues of Rossby, in which the various strands of his article are illustrated and elaborated.

One of Rossby's main topics is concerned with thermal relationships between the atmosphere and the oceans, and the possibility that relatively short-term fluctuations in air temperatures in high latitudes may be transmitted to the bottom water of the oceans, circulated slowly and their effects experienced again centuries later. This discussion of this theme is followed up by six papers on "The sea in motion," by J. Bjerknes, H. Wexler, G. O. S. Arrhenius and others. Another main topic deals with the atmospheric-oceanic exchange of substances like carbon dioxide, sodium chloride and ammonia. The significance of these cycles with regard to phenomena such as the precipitation mechanism, climatic change and salinization in continental interiors is discussed.

By far the greatest part of Rossby's essay is devoted to aspects of the general circulation of the atmosphere. This is to be expected, since it was due primarily to his influence, during the inter-war period, that meteorologists began to re-examine the major features of the planetary circulation in the hope of resolving unsolved problems of the Norwegian "polar front school." Aspects of the planetary circulation are examined also by twenty-six other contributors. The heat budget of the atmosphere, frontogenesis, jet streams, cyclogenesis and purely practical problems of numerical weather forecasting are all fitted into this general context.

The quality of the translation of Professor Rossby's essay is not altogether admirable

but his meaning is usually quite clear. Apart from two papers in German and one in French the whole book is in English and, in the main, it is attractively produced, thoughtfully devised and well illustrated. S. R. EYRE

GENERAL BATHYMETRIC CHART OF THE OCEANS: Sheet A.1, 4th edition. *Monaco: International Hydrographic Bureau*, 1959. 43½×23½ *inches*. Accompanied by Memoir, Special Publication 30 (1958). 10½×7½ *inches; 18 pages*

The General Bathymetric Charts of the Oceans have now been in existence for nearly fifty years, the first and second editions (1903 and 1912) having been published under the auspices of His Serene Highness Prince Albert I of Monaco. Subsequent editions have been prepared by the International Hydrographic Bureau at Monaco. For this fourth edition of sheet A.1 (which comprises the area from the equator to 46° 40′ N., between the parallels of 0° and 90° W.) eighty-four plotting sheets were used, and some 50,000 soundings were transferred to these from the plotting sheets of the third edition. In addition, 47,485 new soundings were plotted, the sources of which were some 100 ships, apart from numerous up-to-date navigational charts from various nations. Of these soundings, 6470 were transferred to the final chart.

One of the major geographical features in the North Atlantic Ocean is the mid-Atlantic Ridge, which Heezen has defined as "that portion of the mid-Oceanic Ridge System which lies within the limits of the Atlantic Ocean." It occupies approximately the central third of this ocean and is of considerable interest not only to geographers, but to geologists and geophysicists. In broad outline the features of this ridge follow a reasonably simple pattern but, with the continuous echo-sounding methods now in general use, extensive variations in depth have been found over wide areas. However, on a chart of this scale (1:10,000,000) it is not possible to show more than the broad outline, and those who want more detail can always refer to the plotting sheets (on a scale of 1:1,000,000), or even make their own to a scale which suits the survey.

In the course of time many criticisms have been made of the Monaco charts (as they are usually known) but, in the earlier days, soundings in the oceans were very sparse and it was almost impossible to assess the accuracy of those submitted. With the advent of echo-sounding not only did lines of soundings become available but it was easier to relate those lines to navigational "fixes." In many places, however, the "cover" was, and still is, insufficient to assess the validity of certain suspected errors in depth. More recently, precision depth recording echo-sounders are being more widely used by research vessels and there seems little doubt now, for instance, that the deeper gully or narrow trench shown on this chart as occurring in the Bay of Biscay does not exist. The bottom here is part of an abyssal plain, with few but regular small variations in depth.

As a general bathymetric chart for use in planning more detailed work, this chart (and, in fact, the whole series) is a useful addition to our knowledge of the oceans. It is only a pity that so many soundings taken by oceanographers and others in the United States of America in the North Atlantic generally, though more particularly in the western part, could not have been made available for this chart. H. F. P. HERDMAN

COASTAL CHANGES. By W. W. WILLIAMS. *London: Routledge and Kegan Paul*, 1960. 8½×5½ *inches; 220 pages; maps, plates and diagrams.* 28*s*

The Department of Geography at Cambridge has already made notable advances in the study of coastal physiography and this new book on coastal changes by W. W. Williams continues the tradition established by Professor J. A. Steers, W. V. Lewis, Dr. Cuchlaine King and others. Despite many additions to coastal literature both at home and overseas during the last three decades, Mr. Williams strikes a new note in his work by concentrating on the changes which are occurring on the coast and analysing, as far as possible, the processes responsible for the modifications. He also directs attention to the important new techniques of investigation, both in the laboratory and in the field, which are being developed in an effort to understand these processes more

fully. Hitherto much has depended on qualitative visual observations; but more recently quantitative, mathematical and laboratory approaches have been tried with varying success.

Mr. Williams's own work on beach gradients during the Second World War is well known and has been the subject of a paper in the *Journal* (Vol. **109**, Pt. 1/3, 1947, pp. 76–93). The determination of beach profiles from aerial photographs, by measuring wave velocities and lengths and then using formulae for the computation of water depths, is but one example of the possibilities which emerge with new techniques. A great deal of work has also been carried out on analysing the processes of coastal change by controlled laboratory experiments and by careful field measurements. An up-to-date appraisal of these approaches is also given in the book. Although the importance of the mathematical aspect is recognized the treatment is largely descriptive and should occasion no difficulty for the general reader. The book should prove to be a useful introduction to the more complicated literature for the student concerned with coastal changes, and it also provides a valuable summary account of present day views for other interested parties such as coastal engineers, biologists, oceanographers, etc. It is well illustrated with maps, diagrams and plates and includes a lengthy bibliography. W. G. V. BALCHIN

WEATHERCRAFT: simple experiments in practical meteorology. By L. P. SMITH. *London: Blandford Press*, 1960. 9×6 *inches;* 86 *pages; maps and illustrations.* 9*s* 6*d*

The experiments described in the nineteen chapters of this interesting little volume begin with simple matters like the correct siting and reading of thermometers and rain-gauges, pass on to the observation of clouds and sky signs, ground frosts, soil temperature, etc., and conclude with more complex work such as greenhouse climatology, and science and art of watering. The last chapter applies the knowledge of wind behaviour to sailing craft.

An instructive series of charts of average daily transpiration of water from plants in the British Isles over the six summer months April to September shows the advantages that would accrue to irrigation in the south-east of England. The monthly values seem everywhere more closely related to the strength and duration of solar radiation than to average air temperature decreasing from a maximum in June in the order July, May, August, April, September.

A diagram on page 49 relating to the "equation of time" shows local noon at Greenwich to be more than a quarter of an hour ahead of Mean Time in November, and as much behind it in January. This indicates why the afternoons in November and early December, and the mornings in late December and January, appear unduly dark with respect to the actually shortest days around December 21. The statement that a south wind in winter in England is *always* warm would read better as "*nearly* always." In certain circumstances a south wind can be very cold, notably when the wind draws temporarily into the south in a depression consisting of polar air with heavy snowfall.

It is noted in a table on page 35 that cold or very cold winters in the last 100 years in south-east England have led to cold springs. Yet it is also noteworthy that some severe winters such as those of 1894–5, 1916–17 and 1946–7 have been the forerunners of great heat in May. The very hot spell from 29 May to 3 June 1947 was most remarkable for developing within a few weeks of the break-up of the great frost; the more so, as it proved to be one of the most intense ever recorded in London at any time during the summer. L. C. W. BONACINA

SALT MARSHES AND SALT DESERTS OF THE WORLD. By V. J. CHAPMAN. *London: Leonard Hill (Books) Ltd.; New York: Interscience Publications Inc.* 10×6 *inches;* xvi+392 *pages; maps and figures.* 95*s*

In this substantial and costly book Professor Chapman has surveyed a great body of published work, much of it his own, on the plant communities of salt marshes and, unfortunately to a much smaller extent than one might expect from the title, salt deserts. The extent of the survey is indicated by the eighteen pages of the biblio-

graphy. The product is a body of varied information; in the present state of knowledge much of it of necessity trivial, presented without noticeable synthesis. The maps and figures are, many of them, crude and contribute little to the development of the author's subject. A recitation of the names of plant associations, broken now and then by arrowed diagrams to indicate their supposed relationships in time and space, may well be of interest to professional ecologists, though the latter may prefer to wait until further work produces more quantitative data on the composition of the communities named, but it makes the book very heavy going for the common reader, who will also find it difficult to disentangle cause and effect in some of the succession diagrams.

Your reviewer finds it hard to believe that the present state of our information on the soils concerned is as confused as Professor Chapman implies. There are regrettably few references in the sections on soils to the current literature of soil science. This is most unfortunate in a book on plant communities whose distribution is closely determined by edaphic factors and, perhaps unfairly, it tends to reduce one's confidence in the book as a whole.

P. H. T. BECKETT

THE GEOGRAPHICAL FRAGMENTS OF HIPPARCHUS. Edited with an introduction and commentary by D. R. DICKS. *University of London, The Athlone Press*, 1960. $8\frac{3}{4} \times 5\frac{3}{4}$ *inches;* 215 *pages; maps, tables and diagrams.* 45*s*

It is a pleasure to welcome a good, new book on ancient Greek geography, a most fascinating but much neglected field of Greek thought. Dr. Dicks has re-edited the geographical fragments of Hipparchus, so well and deeply studied by E. H. Berger nearly a century ago. He provides a readable introduction, followed by the text of the fragments with an excellent translation, and lastly a lengthy commentary which is the most valuable part of the book. This commentary displays the widest reading in both the ancient and modern sources, together with an admirable technical knowledge of the mathematical and astronomical bases of geography. The author's treatment of the value of the stade is an excellent example of his good reasoning and common sense. His defence of the critical methods of Hipparchus is indubitably correct, and he continually illuminates the details of the involved arguments, particularly in the difficult questions of the third and fourth "seal" of Eratosthenes. The discussion of "*climata*" is admirably exhaustive, and the account of the variable obliquity of the ecliptic helps considerably in clarifying the finer points of the ancient reckonings of latitude.

Now a few minor points of disagreement. It does not appear that Posidonius is "obviously one of the later authorities" (p. 146) mentioned in fragments 35 and 36. It is, in fact, clear from these fragments that the date of these authorities lies between Eratosthenes and Hipparchus, and this excludes Posidonius. The connection of Posidonius with a minimal measurement of the earth's circumference is probably quite accidental, as Berger pointed out. Again the statement about Berger's "complete contradiction" (p. 161) goes too far. A latitude table is not a map. Dr. Dicks's view may well be correct, but the words of Strabo specifically support Berger's account. Finally, in his excellent section on Pytheas he may find it possible to reconcile the merely superficial discrepancies of the stadiastic and astronomical data.

These points are merely peripheral to a work of rare excellence, to which one hopes the author may soon add the companion volume which he promises on the astronomical and mathematical work of Hipparchus.

J. J. TIERNEY

THE TRANSITS OF VENUS: a study of eighteenth century science. By HARRY WOOLF. *Princeton, N.J.: Princeton University Press; London: Oxford University Press*, 1959. $9\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xiii+258 *pages; maps, illustrations.* 48*s*

Sir Charles Snow, viewing the world from the University of Cambridge, has told us that the whole of western society is increasingly being split into two polar groups. At one pole are the literary "intellectuals," at the other the physical scientists. Sitting side by side at the High Table, the physicist and the classical don are silent. They have no common language by which they can communicate. It is possible that works like

that under review, dealing with the history of science and technology, will in future provide a field of common interest, if only in fault-finding. For who is to write such books? The scientist is untrained in handling documents; the historian knows no science. Each can be faulted by the specialist.

The Transits of Venus have been studied by Harry Woolf, an American historian, and the editor of *Isis*. He is unaccustomed to precise numerical measurement and is therefore understandably careless about units. He sees no harm in speaking of the "mean radius" of an elliptical orbit and, rather more absurdly, translates the French *livre* by the symbol "£" of the pound sterling. This gives a French astronomer the truly princely salary of £3000, while his humble assistant gets £600 a year. More serious is the misfortune attending a column of figures giving various values assigned to the sun's parallax, and the corresponding mean solar distances deduced from them. Only the first parallax value is given a unit, and this in minutes of arc where it should be seconds. It would have been a great advantage if an astronomer had been called in to give a clear mathematical exposition of the principles employed in determining the sun's distance by a Transit of Venus. The book cries out, too, for a map pin-pointing the places of observation.

All this being said, the book is well worth the attention alike of the general reader and the university student. It tells from original documents the story of a great co-operative scientific enterprise, carried out in part when the leading participants were actually at war. The rare events which were to be precisely timed were due to take place in 1761 and 1769. The observers were defeated by the fact that the atmosphere of Venus blurred the moments of her touching and parting from the sun's disc. But the value of the story lies in the detail of preparation and organization and in the picture that it affords of a scientific world. The chief emphasis is on the French scene, beside which the chapter on the English work, based almost entirely on the records of the Royal Society, reads a little tamely. Personalities are not brought alive as are those across the Channel, although due honour is done to Edmund Halley for his prescience in 1716. Professor Woolf relies on Daumas' excellent book for instruments and instrument-makers, but perhaps it leads him a little astray about the Englishmen. Bernoulli was already taken aback by the signs of mass-production he observed in Peter Dollond's workshop, while the presence of instruments by James Short in so many European observatories meant not that he was prolific, but that he had an outstanding reputation for the accurate grinding of reflectors.

As might be expected, there is a very valuable bibliography, although the Hakluyt Society's edition of Cook's *Journal* may be overlooked, as it is only listed under the editor's name.

E. G. R. TAYLOR

A SHORT HISTORY OF SCIENTIFIC IDEAS TO 1900. By CHARLES SINGER. *Oxford: Clarendon Press*, 1959. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xx+525 *pages; plate, text-figures.* 35*s*

The recent death of Professor Charles Singer, a world authority on the history of science and medicine, lends a special interest to this latest book on a subject which had occupied the greater part of his life. It is largely derived from the author's standard work 'A short history of science' published in 1941, but has been largely rewritten and brought up to date, partly with the aid of Professor H. Dingle, Dr. Derek Price and Dr. Angus Armitage. The result is a clear, concise and well illustrated account of the subject from the first systemization of knowledge in Mesopotamia about 1800–1600 B.C., and its growth in Egypt, Ionia, Magna Graecia, Athens, etc., down to about 400 B.C. This section contains interesting maps of the ancient world. The next chapters deal with the heroic age of Greek science, 400–300 B.C., in which the object of each investigator was to fit his observations and the laws that he deduced into some general scheme of the universe. The "second adventure", from 300 B.C. to A.D. 200, saw the divorce of science and philosophy and includes a reconstruction of Ptolemy's map of the habitable world and also the British Isles. With the growth of Imperial Rome science became the handmaid of practice; then about A.D. 400, theology became

the Queen of the Sciences. The revival of learning came with the recovery of the Aristotelian texts in the thirteenth century and the rise of humanism. The "insurgent century," 1600–1700, saw the downfall of Aristotle and new attempts at synthesis, culminating in the Newtonian key to the mathematics of the heavens and the enthronement of determinism, A.D. 1700–1850. The culmination of the mechanical view of the world brings this history down to the turn of the century. This attempt to place basic scientific ideas in a framework of world history includes not only the physical and chemical disciplines, but also biology and is likely to remain a standard work on the subject for many years to come. EDWARD HINDLE

GENERAL

GEOGRAPHICAL ESSAYS IN MEMORY OF A. G. OGILVIE. Edited by R. MILLER AND J. W. WATSON. *Edinburgh: Nelson*, 1959. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* 246 *pages; plates and text-figures.* 42*s*

Alan Ogilvie was on all counts one of the very considerable figures in British geography during the formative period that succeeded the pioneering efforts of Mackinder and Herbertson, a period which can already be seen to have been rich in such figures. This volume, originally conceived as a *Festschrift* to mark his retirement, was converted by his death in harness in 1953 into a posthumous tribute by a group of his former students and colleagues. It is a worthy tribute. The ten contributions are all substantial pieces of work in both quality and quantity, and all alike break new ground in areas or in topics over which Ogilvie's own catholic interests had ranged. Selection from among good things is invidious and is in any case bound to reflect a reader's own tastes, but space cannot be found for adequate mention of every essay. The following comments, therefore, are offered merely as sample appreciations of a very successful symposium. The preface by the editors sketches Ogilvie as a teacher and university elder statesman —a just tribute, but disappointing in that no explicit picture is given of Ogilvie the man, respected and admired by his peers and held in affection by his juniors for his unfailing courtesy, consideration and encouragement. J. N. L. Baker gives a characteristically scholarly account of Ogilvie's training, methods and accomplishments, focusing on both his width of interest and his faith in regional geography as the unifying core of the subject. D. L. Linton's "Morphological contrasts of eastern and western Scotland" is a masterly survey of a voluminous literature and a re-interpretation based on his own field studies and illuminating mapping. J. K. Wright, in "Some British 'Grandfathers' of American Geography," makes a fascinating excursion into a little known period and facet in the history of the subject. J. W. Watson uses relict features to illustrate dynamic aspects in the urban growth of Halifax, N.S., a method of attack that deserves the flattery of imitation. R. Miller and J. M. Houston give admirable examples of the synthetizing of physical, historical, economic and social geography in regional studies, the former on Orkney, the latter on the Plain of Valencia. And these are merely examples from a volume that every geographer who reads it will want to have on his shelves. R. O. BUCHANAN

GÉOGRAPHIE UNIVERSELLE LAROUSSE: 2. Afrique, Asie Péninsulaire, Océanie; 3. Extrême Orient, Plaines Eurasiatiques, Amériques. Edited by P. Deffontaines, with M. Jean-Brunhes Delamarre. *Paris: Larousse*, 1959–60. $11\frac{1}{2} \times 8$ *inches;* 392 and 408 *pages; maps and plates.* £5 15*s each*

These volumes complete the work of the first volume which was reviewed in the *Journal* for March 1960. It follows that they are on the same lavish and profuse scale of production. One wonders why interest in such sumptuous geographical publication is so slight in England as to make their production economically impossible. As in Vol. 1, the treatment eschews the long-standing continental divisions, and groups together countries touching the same ocean. This leads in Vol. 2 to the curious inclusion of North Africa, the Middle East and New Zealand with countries bordering on the Indian Ocean and in Vol. 3 of Russia, eastern North and South America,

with the Pacific lands. Within each of these artificial regions the unit of treatment follows the old-fashioned political divisions. The text, which is encyclopaedic, has been written by an impressive number of contributors: sixty-four in Vol. 2 and sixty in Vol. 3. Among those of the former volume is Professor L. Dudley Stamp, who describes Malaya, and of the latter volume M. Georges Jorré, who was responsible for the article on the Soviet Union. The contributions follow no standard pattern of treatment, but each uses an arrangement appropriate to the country described. As might be expected, the quality varies, ranging from the excellent description of the United States and the Soviet Union on the one hand to the rather meagre account of New Zealand on the other. Descriptions of French territories, past and present, are as a rule fuller than those of most other lands. Both volumes are generously illustrated with maps in colour, diagrammatic maps, and large numbers of photographs in colour and in black-and-white, all of which are provided with instructive captions. Here are indeed two magnificent picture-books, whose photographs are excellent technically and as illustrations of the countries concerned. This enhances the value of the books, and, though the price may be a deterrent to the ordinary reader, they should prove to be a necessity in school, university and public libraries.

E. D. LABORDE

TAGUNGSBERICHT UND WISSENSCHAFTLICHE ABHANDLUNGEN: Deutscher Geographentag Würzburg, 1957. *Wiesbaden: Franz Steiner*, 1958. 9×7 *inches;* 560 *pages; maps, plates, diagrams*

This large volume contains the committee reports and scientific papers of the conference of German geographers held at Würzburg from 28 July to 5 August 1957. The committee reports take up the first forty-four pages, and the rest of the publication consists of more than fifty papers. Although some of these are not the direct result of fresh research, but rather the exemplification or restatement of already published ideas, the number remains astounding. The majority of the papers are grouped (as presented at the Conference) according to their relevance to some controversial theme. The discussion on the same themes, which took place after the reading of the papers, is also printed. The themes included the industrialization of underdeveloped countries, the formation of surfaces in the tropics, fluctuations of the climate during the last 1000 years, and the medieval landscape. The range of interests is therefore extraordinarily wide; the task of the reviewer extraordinarily difficult. Indeed the whole work produces the rather discouraging feeling that it has become impossible for anyone to keep reasonably abreast of developments in all aspects of our subject.

The number of papers treating the separate themes varies considerably. Indeed, there is only one paper on the problems of plant geography. This is by Schmithüsen and is concerned with the relationships between the various methods of vegetation mapping, that is: by physiognomy, using such descriptive terms as wood, steppe, etc.; by floristic provinces, according to the distribution of various taxa; by plant communities. The paper is well illustrated, mainly with examples drawn from Chile. Schmithüsen ends with a plea (which we hope is unnecessary in Britain) that in the same way as economic geography has been well served by geographers with a knowledge of economics, biogeography will be best advanced by geographers with a knowledge of plant-sociology. Although the plant geography section is thus a slender one, the paper by Wilhelmy "Das Grosse Pantanal in Mato Grosso" is in part concerned with vegetation. The Pantanal is a down-faulted area along the Paraguay, some of which is subject to flood every rainy season. It is distinguished by the large number of small lakes, that Wilhelmy considers to be meander cores. The meanders of the Paraguay tributaries flow between levees above the level of the land. Abandonment of a meander leads to the formation of a circular levee enclosing an area of lower land which becomes flooded in the rains. Thus far the paper may be described as morphological, but the levees and the lakes offer a variety of habitats and the vegetation of these is well described, concluding a readable and interesting paper.

The section dealing with the formation of surfaces in the tropics is full of interest

for the geomorphologist. Although the five papers show differences of view, they have in common their development of the ideas of "Klimamorphologie," and consequently the emphasis they place is on the variation of process with climate. Louis's ideas that in the humid tropics erosion surfaces are formed above base-level have won some acceptance, and this means that for a number of German morphologists there can be no application of cyclical ideas to tropical areas. Of the papers, that by Büdel "Die Flächenbildung in den feuchten Tropen und die Rolle Fossiler solcher Flächen in anderen Klimazonen" is the most stimulating. He draws attention to the complex form of such surfaces. Near the mountain rim the surface may be a true rock-cut feature. Away from the rim it is no more than the top of a variable thickness of decomposed rock, and a further important surface, that of the unweathered rock, lies deep beneath the mantle. When the mantle of waste is removed, as in many now-temperate areas that formerly experienced a tropical climate, a double surface will be present: the rock-cut feature near the mountain rim, and the revealed unweathered rock. The importance of this to the interpretation of Tertiary surfaces in Europe is obvious.

K. Kayser's paper "Zur Flächenbildung, Stufen- und Inselberg-Entwicklung in den wechselfeuchten Tropen auf der Ostseite Süd-Rhodesiens" is largely a critical examination of the ideas of Lester King and should not be overlooked by any interested in the theory of pediplanation.

The major theme dealt with in the historical geography section is the growth of the village as a form of settlement in Germanic lands. A measure of agreement seems apparent in papers by Müller-Wille, Jäger and Mortensen that an earlier form of Germanic settlement was the hamlet, and that the village grew from the hamlet. The reasons for this growth are discussed by Müller-Wille and three hypotheses emerge:

(1) the abandonment of some hamlets and the re-grouping of their inhabitants in villages, owing to the influence of town growth and the potential freedom of some town law.

(2) Growth of population and development of fresh farms around the original nucleus.

(3) The spread of arable farming and a consequent pressure on grazing land. This in turn led to a re-grouping into villages because of the need for ring fencing.

These hypotheses are also linked with another of the important questions of historical geography; that is, the development of the open-field (three-shift rotation) system of cultivation. All the papers of this section are important to historical geographers in this country because of their general relevance, and one paper, "Langstreifenfluren in Nordengland, Wales und Schottland," by Uhlig, is directly concerned with British examples. Jäger's paper in the same section "Wege der agraren Kulturlandschaftentwicklung in Randländern der Nordsee" is a very useful short introduction to many current ideas on settlement. Czajka's paper "Fragen der flächenhaften Abtragung am Beispiel Nordostbrasiliens" in the morphological section is to be recommended for a similar reason.

E. M. YATES

BIOGRAPHY

GEORGE PERKINS MARSH: versatile Vermonter. By DAVID LOWENTHAL. *Columbia: University Press; London: Oxford University Press*, 1960. 9 × 5½ *inches; 441 pages; plates.* 52*s*

George Perkins Marsh (1801–82) was born at Woodstock, Vermont. He was a man of many parts and had a varied career which is well outlined in this interesting and scholarly volume. Marsh made many contributions to philology: he wrote the first Icelandic grammar in English, as well as several books on the English language. But he was a practical man of affairs as well as a writer. He spent six years as a Congressman in Washington, where he helped to found the Smithsonian Institute, and five as United States Minister to Turkey. He passed the last twenty-one years of his life as Minister to the newly unified Kingdom of Italy. His greatest work, 'Man and Nature; or physical geography as modified by human action' (1864), was written in Italy. It

was rejected by John Murray before being published by Scribner. The importance of this book was recognized from the first, but it appears to have been somewhat neglected in the early part of this century. Nevertheless, Marsh's achievements were well known to W. M. Davis and there has been a recent revival of interest; in 1956 eighty scholars from many countries paid tribute to Marsh's pioneer work in a symposium held at Princeton.

Mr. David Lowenthal describes 'Man and Nature' as "the most important and original American geographical work of the nineteenth century," and there are good grounds for supporting this verdict. Marsh's main argument concerned the changes that a single generation can make on the face of the land. He blamed the improvident waste of farmers for the removal of the forest cover and his pioneer work led in due time to the American conservation movement. For geographers Marsh's philosophy has an even wider interest. He himself said that his book was "a little volume showing that whereas Ritter and Guyot thought that the earth made man, man in fact made the earth." He objected to the idea that only the measurable is worthy of serious study. In Mr. Lowenthal's words Marsh "excelled in synthesis because he believed in it; the totality of nature rather than its constituent parts remained for him the fundamental reality." E. W. GILBERT

NANSEN THE EXPLORER. By EDWARD SHACKLETON. *London: Witherby*, 1959. 8½×5½ *inches; 209 pages; maps and plates.* 18*s*

As the title suggests, this is not a full biography. It is a straightforward, unbiased narrative of Nansen's Arctic journeys based mainly on published sources. Lord Shackleton is himself an Arctic explorer and the son of one of the greatest Antarctic explorers; his book naturally tends to concentrate on Nansen's contribution to the technique and advance of polar travel. Nansen's mind was ever youthful and open to new ideas. His success as a polar explorer was to a great extent due to his use of new equipment: ski, light sledges, kayaks, aluminium cookers and fresh food. He was quick to appreciate the value of new inventions for the improvement of polar transport; aircraft attracted his attention in particular. One cannot but feel that the "taming" of the Greenland ice cap by aircraft and tracked vehicles and the navigation of the Arctic Ocean by atomic submarines are advances of which Nansen would have heartily approved. Nevertheless, Lord Shackleton's re-telling of the first crossing of Greenland and the remarkable drift of the *Fram* should serve as salutary reminders to those of us who take these present-day wonders for granted of the debt we owe to the originality, perseverance and stamina of this unique man. H. G. R. KING

SVERDRUP'S ARCTIC ADVENTURES. By T. C. FAIRLEY. *London: Longmans*, 1959. 8½×5½ *inches; 305 pages; charts and plates.* 30*s*

Mr. Fairlie has condensed to less than half its original length Otto Sverdrup's 'New land' first published in English in 1904. He has succeeded admirably in preserving the essential freshness of the original edition and has added to its usefulness by adding a biography of Sverdrup and an account of the role he played in the dispute between Norway and Canada over the ownership of the Arctic islands he discovered. The valuable scientific reports are naturally omitted. The recent "oil rush," in which many large oil companies staked claims over a vast area of the Canadian Arctic archipelago, including large sections of the Sverdrup Islands, lends a special timeliness to this book. H. G. R. KING

WILFRED GRENFELL: his life and work. By J. LENNOX KERR. *London: Harrap*, 1959. 8½×5½ *inches; 272 pages; endpaper maps, plates.* 18*s*

This, the only authorized and full biography of the founder of the Grenfell Mission, was commissioned and sponsored by the Grenfell Association of Great Britain and Ireland. Mr. Lennox Kerr has done a great deal of research among the family papers and the Association archives, and has spent some time on the Labrador coast. The result is an intelligent and objective portrayal of an extraordinary character—impul-

sive, unpredictable, irresponsible, eternally youthful. Much light is thrown on the circumstances which combined to convert these potentially self-destructive forces in Grenfell's character into a tremendously constructive power. His wife, Anne, was an especially stabilizing influence.

When Grenfell first visited Newfoundland and Labrador in 1892 he found poverty, sickness and economic distress. He dedicated his life to helping a degraded people find their self-respect through practical Christianity. He built hospitals and preached self-help and temperance. The work grew and today the most modern facilities, operated by a skilled and devoted staff, constitute a unique monument to the high vision and courage of the mission's founder. H. G. R. KING

GUIDE BOOKS

Edited by A. Gordon Brown and published by Robert Hale for the Union-Castle Mail Steamship Co., the Year Books and Guides to Southern Africa and to East Africa are excellent value at 10*s* 6*d* and 8*s* 6*d* respectively. The Southern Africa handbook, consisting of 750 pages and a 48-page atlas by John Bartholomew, covers the Union of South Africa, the Federation of Rhodesia and Nyasaland, Bechuanaland and Swaziland. In addition to the atlas section there are many town plans and a new map in the text of the Drakensberg Mountain area. The East African handbook, with 350 pages and a 12-page atlas section, treats fully of Kenya, Uganda, Tanganyika, Zanzibar, Portuguese East Africa and Mauritius, and in less detail of Sudan, Eritrea, Somalia, the Congo, Madagascar and the Seychelles. A very useful feature, new to both handbooks, is the hotel and restaurant guide, enlivened by drawings by Roy Davis. The editor has advisedly listed hotels and restaurants alphabetically and refrained, at this early stage of tourism in Africa, from grading them or from making specific recommendations. SOUTHERN AFRICA has a section for motorists with detailed information on mountain passes, and both books have a "Shell" motoring map folded into an end pocket.

Also published by Hale for the Union-Castle is the second edition, by A. Gordon Brown, of MADEIRA AND THE CANARY ISLES, a well illustrated handbook, with clear maps, at the reasonable price of 8*s* 6*d*.

The "Globetrotter Guides" to Europe, published by Stauffacher of Zürich, are being issued in this country by the Galley Press, Aldine House, London. The series begins well with SWITZERLAND, by Eugen Th. Rimli, and AUSTRIA, by Carl Heller-Merricks; ITALY is promised shortly, and other countries are in preparation. The guides, at 12*s* 6*d* each, are a neat size for the pocket and contain itineraries which will be particularly useful to motorists. 'Switzerland' has a good folding map of the country; both have small index maps with a large number of place-names, and are well illustrated. D. M.

SHORTER NOTICES

"Ye'll find nae artificial beauties in Scotland," as a chance travelling companion observed of the scenery between Stirling and Oban, and this verdict is borne out in a handsome new publication, entitled SCOTLAND'S SPLENDOUR (*Collins*, 1960, 35*s*). Pictures are included of comely houses, romantic castles and fine towns, but it is the natural beauty of the landscape which catches the eye and stays in the mind. Edited by J. B. Foreman, the book is divided into seven regions described by George Blake, W. H. Murray, J. S. Grant, Seton Gordon, Tom Weir, John R. Allen and Moray McLaren, and illustrated by photographs from the *Scottish Field*, neatly related to key maps. End-paper maps of south and north Scotland, a "pictorial map" in colour and an index complete a book which will give pleasure to many. D. M.

* * *

SOUTH FROM TOULOUSE, by Andrew Shirley (*Chatto and Windus*, 1960, 25*s*) is an entertaining and curiously un-modern travel book, written in the style of a Victorian

don at large. It explores that part of Southern France which lies between the three Pyrenean passes of Bourg-Madame, the Via Domitia and Le Perthus; a strongly individual region with a history of feuding, fighting and fanatical heresies. The late Andrew Shirley was a specialist in both architecture and cookery and the main interest of the book lies equally between these arts, rather to the exclusion of the natural landscape. G. A. L.

* * *

Eric and Barbara Whelpton are equally at home in Italy and France; it was a happy thought to write a travel book about the three Mediterranean Islands, of which two are Italian and one French. SICILY, SARDINIA AND CORSICA (*Robert Hale*, 1960, 21*s*) is the usual pleasant blend of ancient and modern information which we expect from these authors, and Mrs. Whelpton (the artist, Barbara Crocker) has designed a lively jacket on which the contrasting shapes and personalities of the three islands are cleverly suggested. The illustrations are first class, but it is a pity that, presumably in order to do full justice to three different regions, the print should be one size too small for comfort. D. M.

* * *

Zahra Freeth is the ideal wife to take to a tropical post. Accompanying her husband to a bauxite-mining town in British Guiana, Mrs. Freeth took every opportunity to explore her surroundings, make notes on the natural history, sample the native foods and delve into local records. Tiring of the expatriates' compound, the Freeths moved into the Guianese town and shopped in the markets. Mrs. Freeth writes well, although sometimes in the style of the better Colonial handbooks. For an authentic and informative account of life in British Guiana RUN SOFTLY, DEMERARA (*Allen and Unwin*, 1960, 21*s*) could hardly be bettered, except that many will be puzzled by the provenance of the immigrant "East Indians" frequently referred to. This ambiguous term would have been better avoided. Readers will generally agree with the author that life in a tropical mining town "is not to everyone's taste," but Mrs. Freeth clearly made the best of it. P. B.

* * *

Our native flowering trees rarely approach the brilliance of those of the tropics. Venezuela is well endowed with fine specimens and many are illustrated in ARBOLES EN FLOR DE VENEZUELA (*Compañia Shell de Venezuela*). The book is lavishly produced and the twenty-three colour plates are of remarkably high standard. Each plate bears the scientific and vernacular name of the tree it depicts, and accompanying each general view is a close-up of the flowers themselves. There is also a useful botanical appendix. The book will delight both amateur and professional botanists, and teachers of systematics will find it a valuable source of illustrations. It is not, however, generally available in this country; a copy is in the Society's Library. P. B.

* * *

J. Frank Dobbie, for many years an Assistant Professor at Texas University and also editor of the publications of the Texas Folklore Society, knows more than most people about America's romantic South-west. LOST MINES OF THE OLD WEST (*Hammond, Hammond*, 1960, 30*s*) was originally published in the United States as 'Coronado's children'; it contains a number of fascinating tales, part fact and part legend, of old diggings of silver and of gold which would make the fortune of whoever discovers or rediscovers them. The South-west, with its strong Spanish affinities, has a flavour all its own which Professor Dobbie knows well how to re-create. D. M.

* * *

In DAUGHTERS OF ALLAH (*Allen and Unwin*, 1960, 21*s*) Henny Harald Hansen, a Danish ethnologist, has given a vividly descriptive account of her experiences as a woman living among Moslem women in Kurdistan. The Kurds have been subject to frequently changing foreign rule and today their lands lie within the frontiers of Iraq,

Syria, Turkey, Iran and the U.S.S.R. In 1957 Henny Hansen was invited to take part in the Danish Dokan expedition which proposed to carry out archaeological excavations in northern Iraq. Instead of settling down with the expedition she spent almost the whole of her time among the Kurds. Through her woman interpreter she was welcomed in many Kurdish homes which would normally have remained closed to a non-Moslem woman. She visited the mountain villages of Iraq Kurdistan and gained an intimate insight into the daily life of the women of this strange and ancient race. Some readers may well disagree with the author in thinking the lot of women in purdah an enviable one, but she paints an interesting picture of the world beyond the invisible wall which divides female from male in a Moslem community.

E. M.

* * *

Nigel Heseltine and a somewhat nebulous companion set out to motor from Misurata, on the Libyan coast, some 2000 miles to Lake Chad. Well before half-way their jeep had to be abandoned, and the journey finished by means of lifts in a convoy of "La Tunisienne Automobile Transports," and by camel-back. It is, perhaps, the former expedient that gives the particular relish to FROM LIBYAN SANDS TO CHAD (*Museum Press*, 1960, 27*s* 6*d*): the long days of travel through savage terrain and with an occasional sight of elusive and primitive people, seen against a background of matter-of-fact French lorry drivers and soldiers in remote military posts. Whatever the secret, this is an outstanding book. Mr. Heseltine is a genuine traveller, relying neither on letters of introduction or Acts of God to smooth his way, and with a talent for describing what he keenly observes. The southern Sahara is new to most people, as are the tribes, Toubbou, Ounias and others, the prehistoric rock paintings and burial mounds in the Tibesti area, and the Red, Blue and Sweet Water lakes. There are good sketch-maps and photographs—of which the four coloured ones are outstanding.

L. M. F.

* * *

ARCTIC WORLD by John Euller (*London and New York: Abelard-Schuman*, 1959, 12*s* 6*d*) is divided into four parts: "The ocean," "The land," "The friendly Arctic" and "Modern man in the Arctic." In each part the theme is based on the exploits of great men, such as Nansen, Peary, Amundsen, Rasmussen or Stefansson, and on the work of more recent expeditions and military operations, up to the time when the crossing of the Arctic Ocean by a nuclear submarine became more than a probability. A highly selective treatment in so short a book is acceptable. Less acceptable is the author's descriptive style of which the following phrases are choice examples: "The great brown river" for the caribou migration; "children of the ice cap" for icebergs; and "the mainland, deeply wounded by a gargantuan bight called Hudson Bay." However, the reader who knows very little about the Arctic will find the book informative and, on the whole, written in a way which should encourage him to read more.

G. H-S.

* * *

In MACKENZIE'S GRAVE (*Hodder and Stoughton*, 1959, 25*s*), Professor Owen Chadwick has given us a valuable picture of the first phase of the Central African Mission's work in what is now Nyasaland. Largely by quoting the journals and letters of the actors themselves, he brings to life the tragic drama of Bishop Mackenzie and his small party of fellow-workers who went to Africa in response to Livingstone's appeal. We see the saintly bishop and his other-worldly colleagues go down before the stern realities of dirt, disease, treachery and bloodshed. Livingstone has a major part in the play, which throws much light on his character and behaviour at a time in which, it is well known, he does not show to advantage. Those who today feel inclined to solve practical political problems by the simple application of lofty principles should read this book.

R. M.

* * *

Hugh B. Cott, a Cambridge zoologist, spent a little over a year in Uganda investigating the ecology and status of the Nile crocodile, and UGANDA IN BLACK AND WHITE (*Macmillan*, 1959, 30*s*) is a by-product of his journeys by land, river and lake all over the Protectorate. It consists of over a hundred pen drawings of the Africans, fauna and scenery he met on his travels, with descriptive notes on each subject. A brief report can give no adequate picture of the charm and interest and real excellence of this book. The essential flavour, almost the scents and sounds, of the country have been captured to a quite uncanny degree, far beyond the range of photographic records. No one who has lived or travelled in Uganda can fail to be delighted with this book. L. M. F.

* * *

SEAPORTS SOUTH OF THE SAHARA (*New York: Appleton-Century-Crofts*, 1959, $6) by Robert Greenhalgh Albion belies the romance suggested by the title and is a very solid and factual account of American maritime relations with South, East and West Africa since 1914. It is, in particular, an account of the activities of the Farrell Lines, a third-generation American shipping company. There are copious notes and tables to support the narrative. L. M. F.

* * *

Whatever weaknesses Mr. Hammond Innes's stirring adventure stories may display, few critics would deny his ability to create a vivid and living background—be it desert, snow, forest or mountain—and a travel book by him holds a promise of good entertainment. Oddly enough HARVEST OF JOURNEYS (*Collins*, 1960, 18*s*) fails to live up to one's expectations. It contains accounts of journeys in five very different lands: Arabia and the Persian Gulf, Norway, Morocco, the Low Countries and Canada, well loaded with anecdote and curious fact; and some excellent photographs and adequate sketch-maps—but still it makes dull reading. L. M. F.

* * *

In Idaho there is, or was, a rare blue goat; in the Red Sea hills of the Sudan dwells, or dwelt, a wild ass; and in the Azande region of the same country a red buffalo. Michael Mason's THE WILD ASS FREE (*John Murray*, 1959, 21*s*) is the account of the safaris he made between 1930 and 1938 in search of these rare beasts, and of other similar matters. A rarer specimen than all of them, if one may be forgiven the comparison, is Mr. Mason himself. Pipe in mouth and glass in hand, he spirits one back to a forgotten world of *Chums* and the *B.O.P.*, the now incredibly remote way of life of the wealthy Edwardian sportsman. One can hardly credit that it all happened so recently, and so comparatively close at hand. Mr. Mason's is the colloquial style of the fireside *raconteur*; one envies his young family the yarns in store for them—and not many fathers would be prepared these days to put on record this one's opinion of his Central African "boys." "I worked them like dogs and when they displeased me I beat them like dogs. They didn't mind a bit, for after a while I came to love them like dogs." L. M. F.

* * *

THE LURE OF THE AMAZON (*Souvenir Press*, 1959, 21*s*), describing a number of excursions in the region, is very readable, and Eduardo Barros Prado evidently knows the country he describes. The visit to the "fabulous Amazons," their villages consisting only of women and segregated children, nevertheless strains the reader's credulity; their existence will come as a surprise to competent anthropologists. Scepticism is not lessened by their being unrepresented in the numerous photographs in the book, despite their willingness to pose for the camera. The customary eating of the unwary tourist by piranhas also occurs in the narrative. P. B.

* * *

Well-known as an interviewer on television, Jeanne Heal has applied her skill in assessing personality most successfully in A THOUSAND AND ONE AUSTRALIANS (*Michael*

Joseph, 1959, 18*s*). In the course of some three months in Australia it is quite possible to believe that Miss Heal—observant, sociable and kindly—met no one she disliked, and many who became firm friends. She was interested wherever she went, and happy everywhere except Sydney; she lost her heart most completely to Tasmania. Miss Heal has succeeded in giving a lively and convincing picture of Australia and her studies of "New Australians"—from all over Europe as well as from Britain—are most illuminating. D. M.

* * *

Mr. Alan Stevenson, a distinguished lighthouse engineer, and one of a family of distinguished lighthouse engineers, has already published a small and delightful book dealing with the English lighthouse tours of Robert Stevenson, 1801–18. He is thus well qualified to compile this larger, and lavishly illustrated, work—THE WORLD'S LIGHTHOUSES BEFORE 1820 (*O.U.P.*, 1959, 63*s*). Part I deals with seamarks before 1690 and lists chronologically the more interesting attempts at improvements before 1820. Part II elaborates certain histories, particularly the successive attempts to build a lighthouse on the Eddystone. Part III describes the methods of illumination used in early lighthouses. G. N.

* * *

The history of Sarawak for a hundred years was the history of the Brooke family: of James Brooke, who came to the country to trade in 1838; of his nephew Charles, who ruled from 1868 to 1917; of Charles's son Vyner, who handed Sarawak over to the British Crown in 1946. Eccentric and resolute men, the Brookes wrote a unique and romantic chapter in Commonwealth history to which Robert Payne does full justice in THE WHITE RAJAHS OF SARAWAK (*Robert Hale*, 1960, 18*s*). The book contains reassuring evidence of consultation with the Brooke family, it is well illustrated and the description of the second Rajah, Sir Charles Brooke, is particularly vivid. D. M.

* * *

The Asia Society (of the United States) has initiated the publication of a series of books whose purpose is the commendable one of bringing the peoples of Asia and America closer together in their appreciation of each other. The first volume to appear is Noel F. Busch's THAILAND (*Van Nostrand*, 1960, 12*s* 6*d*), which has many virtues: it is brief, witty, well-written, sensitive and (unlike some American books on Asian countries) politically realistic. It can be commended as a highly readable introduction to a fascinating country. B. H. F.

* * *

Louise Maitland, the author of FOREST VENTURE (*Robert Hale*, 1960, 18*s*), is the American widow of V. K. Maitland, a British forester who after long service in India became an adviser on forestry and soil conservation to the Development Division of the British Middle East Office. Her book is the narrative of a number of journeys and experiences in the countries between Persia and Algeria, liberally sprinkled with the *dicta* of her husband about forestry, conservation and agriculture. Many Middle Eastern scenes come alive in her pages, as do the zeal and skill of Mr. Maitland. There are, however, a number of factual errors. B. H. F.

* * *

Michael Alexander tells the story of his excursion from Istanbul to north-east Afghanistan in OFFBEAT IN ASIA (*Weidenfeld and Nicholson*, 1960, 21*s*). This is a very little-known part of the world which he aptly describes as the "underbelly of the Bear." The author and his companion found great contrasts in the standards of living where economic and social aid has penetrated. Tragically, some of the improvement represents the competition between East and West to gain the support of these underdeveloped countries only lying a plough line from the Soviet Union. The author undertook some very worthwhile investigations, notably of the caviar industry in the

Caspian. He also has a keen eye for the changing scenery in the Elburz and the harsh conditions in Afghanistan. P. J. T. B.

* * *

The sub-title on the dust-jacket "From the Persian Gulf to Chitral" conveys more about the content of Roderick Owen's book AWAY TO EDEN (*Hutchinson*, 1960, 25*s*), than the title itself. Most of the book is about the author's travels in Pakistan and describes the Pakistani scene about two years ago. The Raj has gone but its influence remains; one gets the feeling of an empty house which is rapidly accumulating cobwebs. Mr. Owen travelled through Sind; interested himself in an orphanage; found a private army in Bahawalpur; went to Lahore; and visited, in the company of an English businessman, some of Pakistan's minor towns—a most instructive interlude. There was still evidence of the tragedies brought about by partition. In the Khyber things were different: at Warsak the independent frontier people, the Pathans, were working on a new dam. There seemed to be some tension in Chitral, which may have been due to the closeness of the Soviet border. P. J. T. B.

* * *

THE TIN SCRATCHERS (*Angus and Robertson*, 1960, 21*s*) reads more like an historical novel than an account of the labours of the author when he was a young man. Ion L. Idriess went to Queensland fifty years ago and his story is a reminder of the rapid development of Australia. One hardly associates with the Australia of this period the effort that was made in the search for tin. Those who undertook this pioneering underwent considerable privation. The book is also a tribute to the early settlers in remote spots who willingly provided food and shelter to such prospectors as Mr. Idriess, young and often ignorant of what lay ahead. This book will be a useful addition to the library of books recalling the history of Australian development. P. J. T. B.

* * *

WAKE UP IN EUROPE by Colin Simpson (*Angus and Robertson*, 1960, 35*s*) is the account of an Australian writer's first travels in Europe. Mr. Simpson was greatly helped by Cook's and by generous introductions and one gets the impression that he travelled expensively though few Australians could afford to emulate him. He visited most of the tourist attractions in Holland, West Germany and Austria and then went to Venice and several other places in Italy and Sicily. He was guided round Switzerland, and toured France and Britain terminating his European tour with a visit to East and West Berlin. The book is said to be lavishly illustrated, but some of the photographs are small and do not represent the places actually visited by the author. P. J. T. B.

* * *

CORRECTION: THE CAXTON WORLD ATLAS (*Geogr. J.* **126** (1960) p. 359)

We have been informed by the Publishers of the Caxton World Atlas that the price quoted in the review includes six volumes of an encyclopaedia. The price of the atlas alone is £13 15*s*, and the opinion expressed in the last sentence of the review is therefore inappropriate.

CARTOGRAPHICAL PROGRESS

PORTUGALIAE MONUMENTA CARTOGRAPHICA. (Comemoracões do V centenario da morte do Infante D. Henrique.) ARMANDO CORTESÃO and AVELINO TEIXEIRA DA MOTA. Four volumes. *Lisbon*, 1960. 24 × 17½ *inches*

Little more than one hundred years ago, the foundations of the systematic study of historical cartography were laid by the publication of two ambitious collections of map facsimiles. In France M. Jomard reproduced maps comprising the principal landmarks in the history of cartography in his 'Monuments de la géographie où recueil d'anciennes cartes européennes et orientales.' Contemporaneously, the Portugese savant, the Vicomte de Santarem, began publication of his 'Atlas composé de mappamondes, de portulans et de cartes hydrographiques et historiques depuis le VIe jusqu'au VIIe siècle.' His aim was rather more specialized than that of Jomard, as he sought to establish the priority of the Portuguese in the modern discovery of Africa. These great monuments are still of cardinal value for students, though because of the period of their production, they have considerable limitations. In the case of manuscript maps, the plates were produced by lithography from manuscript copies of the originals. Since early manuscript maps are notoriously difficult to interpret, and the names are difficult to decipher, or are sometimes illegible, the value of the reproductions depended upon the skill, knowledge and even the predilections of the copyist. A case in point is Jomard's reproduction of the Hereford World Map from a manuscript copy by an ill-informed draughtsman, which is full of misreadings. Nevertheless, these works provided at the very least a means of studying the general characteristics of cartographical development and stimulated the comparative study of early maps. With the progress of printing techniques, many of these shortcomings were removed, but the costs of production remained very considerable, and there are few works to challenge the comprehensiveness of Jomard and Santarem. Among the exceptions should be recorded the contributions of Gabriel Marcel (1893–96), F. C. Wieder's 'Monumenta cartographica' (1925–33), the 'Monumenta cartographica Africae et Aegypti' of Prince Yussuf Kamal (1926–39) and the 'Monumenta cartographica vaticana' edited by Roberto Almagià, from 1944 onwards. Nor should the more restricted works of, among others, A. E. Nordenskiold, F. Kunstmann, E. Organia, F. L. Stevenson and G. Caraci be overlooked. Learned institutions also have made their contribution, as our Society is doing through its series 'Reproductions of early maps.'

To this record of international scholarship, and carrying on the tradition of Santarem, a magnificent contribution has now been made by the Portuguese Government as an integral part of the celebrations in honour of the fifth centenary of the Infante D. Henrique, better known, to English readers at least, as Prince Henry the Navigator. In the four volumes of 'Portugaliae monumenta cartographica' (a fifth is to follow in 1961) the aim has been to present as complete a collection as possible of early manuscript Portuguese charts from *c.* A.D. 1500 to the seventeenth century. A number of these are reproduced in colour, the majority in colotype. This great memorial to the Portuguese contribution to the navigational and cartographical sciences, and thus to the Age of Discoveries and the expansion of European culture throughout the world, was conceived by Dr. Armando Cortesão, for many years an ardent student of historical cartography, and executed by him in cooperation with Commander Teixeira da Mota, an expert in the practical as well as the historical aspects of hydrographical surveying. For the purpose of this work, Dr. Cortesão visited nineteen countries in Europe and America, and has devoted six years' continuous study to it. At the same time, it is proper to record, as is fully recognized in the preface, the high degree of international cooperation which has also made this work possible.

Little fault can be found with the reproductions; the colour plates are particularly attractive, and it is only to be expected, in view of the great size of many originals, that

some names are illegible in the reductions. Each plate is accompanied by a historical and critical commentary, the text in parallel columns in Portuguese and English. The English translation is skilfully done; I have noted only one instance where unfortunately the contrary sense is conveyed, and only one misprint—this in itself is no mean feat. Not the least valuable feature of the text are the extensive bibliographical references. It would obviously be impossible here to give the contents or examine the arguments in detail. Volume I contains the Cantino chart of *c.* A.D. 1502 (a copy of a Portuguese world map made for an Italian prince), all the charts by or attributed to Pedro and Jorge Reinel, works by Lopo Homem and Diogo Ribeiro and three 'Roteiros' of João de Castro.

Among the plates in the second volume are eighty-six representing the output of Diogo Homem, and one of the splendid planisphere of his relative, André Homem, the only surviving work of the man styled by Richard Hakluyt "the prince of cosmographers of this age." Volume III is largely devoted to Fernão Vaz Dourado, and no less than six of his atlases are represented. Volume IV contains one dated chart of Sebastião Lopes, and an atlas and four charts which had not previously been attributed to this chart maker, also all the surviving charts of João Baptista Lavanha, and charts of, perhaps, the greatest cartographer of them all, João Teixeira.

It is thus possible for the first time fully to appreciate the extent and character of the work of a great school of cartography, unexcelled in the sixteenth century, through which a great part of the world was revealed to the West, and one which exerted a profound influence on the development of that science. The compilation of these 'Monumenta' has also brought to light charts whose existence was unknown to scholars; the occasional comments of the editors, incidentally, may also do something to secure the better conservation of charts in general. The work also demonstrates the liability of these documents to destruction, and thus the desirability of having as many as possible placed on permanent record. While it is inevitable that the commentary on so large a corpus of material cannot altogether avoid controversial matters, it is only fair to say, in this respect, that the editors have stated their case unprovocatively, and have set out conflicting opinions in detail. The sketch of the history of cartography, with which the work opens, is very skilful and illuminating; though it would be possible to challenge the writers on some lesser points, I do not think that the main themes could be controverted. The treatment can best be indicated by a short quotation: "No scientific achievement springs from anyone like Minerva from Jupiter's head."

The Portuguese Government are most generously presenting copies of this great work to all the principal cultural institutions in the world, and it is a source of no little satisfaction that the first set to leave Portugal was addressed to the Society's Library. It would be difficult to imagine a more fitting memorial to Prince Henry than these splendid volumes.

G. R. CRONE

ELEMENTS OF CARTOGRAPHY. By A. H. ROBINSON. Second Edition. *New York: Wiley and Sons; London: Chapman and Hall*, 1960. 9½×7 *inches;* viii+343 *pages; maps, diagrams, illustrations.* 70*s*

During the seven years since the appearance of the first edition, this work has become established as the outstanding introductory textbook on the subject in the English language. It is the opinion of the present writer that the original review of this book (*Geogr. J.* 119, 4 (1953) p. 492) did not recognize certain important qualities of the work. These are, first, the lucid introduction to the methods of professional map making, secondly, the extremely important exposition upon map design. Robinson's treatment of the significance of generalization, symbolization and the use of colour is of a higher intellectual standard than the corresponding sections of any other English or American textbook.

The new edition has been expanded to contain nearly 100 additional pages and more than seventy new illustrations. Some of the text has been entirely rewritten to keep pace with recent changes in cartographic techniques and the new ideas of statistical methods applied to distribution mapping. Some of the techniques, such as scribing on

plastic, are now described for the first time (rather briefly, one might add, considering the quantity of recent American literature on the subject). It is surprising, however, that there is still no reference to the production and use of plastic relief models or the new concepts of symbolization thereby introduced. All the material which made the first edition so good remains, but some of the new additions have doubtful value. One might, for example, question the desirability of describing the Thrower-Robinson method of relief shading in detail whereas the same chapter practically ignores European concepts of aerial perspective.

The most important criticism which must be made is about the uneven mathematical standard of the text. On one hand it is assumed that the reader has an extremely limited knowledge of elementary pure mathematics, on the other hand some of the concepts introduced in the text are much in advance of this elementary standard. There is little or no attempt to bridge this gap so that some of the more advanced ideas are presented without adequate proof, explanation or illustration. Three examples of this deficiency may be cited.

The chapters on distribution mapping contain far more statistical ideas than formerly. Professor Robinson emphasizes that this cannot replace the elementary textbook in statistics but then proceeds to show how the arithmetic mean and standard deviation may be calculated. This is the full extent of statistical theory which this book can teach the beginner but, subsequently, the author introduces some fairly refined statistical concepts about covariance, probability and sampling which are not properly explained.

Again, in the new edition Professor Robinson has correctly introduced the use of the fundamental formula of spherical Trigonometry as the only sensible method of determining long distances on the Earth's surface where geodetic accuracy is not required. However, this equation is presented without proof, illustration of the spherical triangle or reference to any source where these may be found. One must therefore assume that the student cartographer will learn and apply this formula by rote, without any proper understanding of the method.

The chapters devoted to map projections are largely non-mathematical. Although the properties of projections are lucidly explained and excellently illustrated, the absence of mathematical symbolization leads to some rather cumbrous expressions of the concepts. Professor Robinson correctly distinguishes between the geometrical, trigonometrical and coordinate methods of constructing map projections but fails to provide any information about the third, and, in practice, most useful of them. In this attempt to save the reader from learning a little elementary coordinate geometry, a number of graphical methods of construction and transformation are described. These cannot be applied with success if the final graticule is to have any pretensions of accuracy. It seems unwise to avoid the mathematical treatment where the alternative graphical methods produce markedly inferior results.

An important addition to the new edition is the non-rigorous proof of Tissot's indicatrix and the resultant equations for maximum angular distortion and exaggeration of area to be derived therefrom. This is virtually the only account of the proof, in English, which gives any indication of the utility of the method for illustrating the distortions and the properties of map projections. The proof given here is, in fact, reproduced from O. S. Adams's paper on polyconic projections which was published by the U.S.C.G.S. in 1934. This, in turn, is an almost literal translation of the first part of Tissot's original essay and does not, therefore, take into consideration any of the slight modifications and improvements introduced by later continental writers. The crux of the proof that an infinitely small circle on the surface of a sphere is transformed into an infinitely small ellipse on the plane surface is the statement that: "the locus of the point M′ is homothetic to that of the point N; the centre of similitude is O and the ratio of similitude has the value a." One can only wonder what the reader, who was elsewhere assumed to be wholly ignorant of plane coordinate geometry, will make of this part of the proof.

Mathematical cartography cannot be effectively taught by verbal description alone.

Some fairly difficult concepts must be absorbed by the student, for example in the proper understanding of the conformal projections. For this reason the present writer believes that it is essential for the student to become acquainted with the necessary elements of spherical trigonometry and coordinate geometry at an early stage in the study of map projections. In short, the mathematical standard of this book is much lower than the high standard set by the remainder of the text. DEREK MALING

AERIAL PHOTOGRAPHIC INTERPRETATION. By DONALD R. LUEDER. *New York and London: McGraw-Hill*, 1959. 10×7 *inches; 462 pages; ground and aerial photographs.* 135*s* 6*d*

The extended use of aerial photographs for civil purposes in the post-war years has at the same time provided a most fashionable and sensible teaching and research tool for geographers. The dearth of comprehensive textbooks on aerial photographic interpretation is now partly corrected by this publication in the McGraw-Hill Civil Engineering Series. As the book is designed for civil engineers rather than geographers, its treatment of aerial photographs is restricted almost entirely to examination of the individual elements of the physical landscape. There is no real treatment of the essentially geographical relationships between the elements, or between physical and human features of the landscape and, for this, there is as yet no alternative to the rather elementary text of Walker, 'Geography from the air' (1953).

However, Lueder's book would seem of great value to the geographer using aerial photographs as a preliminary to field investigation. It is divided into three parts, of almost equal length. Part I, principles and theories of photo interpretation, deals both with the physical properties of aerial photographs and with certain characteristics of the physical landscape, notably drainage patterns and erosion features. Part II is a lexicon of geomorphology and landforms as seen by the aerial photograph—an exhaustive and most valuable summary for the geomorphologist. Part III describes the application of aerial photo techniques to earth sciences other than geomorphology; the principal chapters are devoted to engineering, geology, geophysics, agriculture, forestry, botany and ecology.

The major demand made by the author is that interpretation cannot be successful without critical appreciation. Background training and experience cannot be underestimated; the interpreter can no longer be a mere technician but must have both theoretical knowledge and field experience. The provision of much of this theoretical knowledge is an important and distinctive feature throughout the book, so much so that, in Part II particularly, the aerial photographs become less important than the supporting text. Although the importance of geomorphology and pedology are stressed, the point is not made that geography is likely to provide the best general training for photo interpretation. Indeed, such is the American fragmentation of disciplines that geography is relegated to the status of a "nice-to-know" subject.

The aerial photographs include over a hundred stereopairs and stereotriplets, as well as many single ground and aerial photos. There appear to be one or two very minor cases of mis-interpretation of details on aerial photographs; and on page 199, the term "fluvioglacial" is used, while "glaciofluvial" is used everywhere else.

This publication may be said to meet with distinction the needs of physical geographers. Those more concerned with photographic interpretation of aspects of the human landscape may be better served by the 'Manual of Photographic Interpretation,' shortly to be published by the American Society of Photogrammetry. The prepublication advertisement to this manual refers to chapters *inter alia* on photo interpretation in urban area analysis, archaeology and geography; this manual is eagerly awaited. R. P. KIRBY

THE WORLD IS ROUND: the story of man and maps. By FRANK DEBENHAM with an introduction by BERTRAND RUSSELL. *London: Macdonald in association with Rathbone Books*, 1958. 15½×11½ *inches; 97 pages.* 50*s*

This large-format, somewhat luridly coloured work is a combination of atlas, child's picture-book and elementary primer in historical cartography, geodesy, ethnography,

surveying and navigation of land, sea and air, plus many other aspects of a wide view of geography. It is interesting in many ways. There are good examples reproduced of primitive maps and instruments, and attractive artistic sketches and cartouches. A striking series of maps of the various parts of the world combine shadow-relief tints obtained from specially constructed models with twelve vegetation tints. Many of the maps are on projections which aim at "an entirely new view of the earth."

But except in one or two things it fails as a serious contribution to the advancement of geographical knowledge. The text is superficial although it has the factual gloss of elegantly written advertising copy. The maps are cleverly constructed, but technique has largely been given full play at the expense of easily assimilable fact. They portray a world without roads or railways, where Paris looms no larger than Caen or Cork. The map plates need good and carefully directed illumination to allow interpretation but even then the combination of such abstracted and refined information really requires a trained geographer to realize the hidden wealth portrayed.

IAN MUMFORD

ATLAS OF THE ARAB WORLD AND THE MIDDLE EAST. With an introduction by C. F. BECKINGHAM. Maps by DJAMBATAN, Amsterdam. *London: Macmillan*, 1960. $13\frac{1}{2} \times 10$ *inches;* 28 *pages of text and index*, 40 *pages maps.* 35*s*

THE MIDDLE EAST AND NORTH AFRICA—Oxford Regional Economic Atlas, prepared by the Economist Intelligence Unit Ltd. and the Cartographic Department of the Clarendon Press. *Oxford University Press*, 1960. $10\frac{1}{4} \times 7\frac{1}{2}$ *inches;* 135 *pages.* 42*s*

These two specialized atlases cover the same general area, but the Oxford Atlas adds Cyprus and the countries of the Horn of Africa to those treated in the Djambatan production. Of the two the Djambatan is more attractive. It is big and handsome, with admirably clear, well coloured maps and a fine collection of photographs illustrating Professor Beckingham's geographical and historical essay on the area. The maps present a great deal of useful material and the volume is very suitable for use as an advanced school atlas. It may perhaps have been designed to be particularly acceptable in the Arab countries, for Israel seems to have been given rather less attention than it might have been and the maps on which it is treated are entitled "Jordan Region." Indeed, apparently a special edition of the atlas has been prepared for use in the Middle East.

One could not, however, rely on it as a work of reference. There are too many minor errors, too many places where exact knowledge was lacking. Two characteristic features of the area may serve as examples—the beduin and oil. On the map of "Peoples" on page 7, the names of beduin tribes are scattered with insufficient relevance to the actual importance and position of the tribes named. Thus the Beni Khaled reach from the coast near Latakia across Jordan and into Saudi Arabia. Which "Anaiza" are those shown just south of the Jordanian frontier, and who are the Tamadilla? On page 23 the arrows showing "movements of nomads" in Syria are almost meaningless. It is particularly disappointing that despite the importance of oil in the area and the abundance of cartographical and statistical information available the topic is so poorly treated. The map of oil concessions on the rear endpaper abounds in inaccuracies and misconceptions (although "based" on one prepared by ARAMCO).

The Oxford-Economist Intelligence Unit Atlas scores where the Djambatan production is weakest: it is thorough, reliable, well documented and packed with accurate and detailed information. The maps are not as easy to look at as those of the Djambatan Atlas—they are smaller, not always so well coloured, sometimes overfull of detail and very small print. Nor are the statistics always as up-to-date as would seem possible. One can say no more in criticism of the Oxford Atlas, and its quality as a first rate work of reference merits very high praise. The forty maps are followed by detailed supplementary notes and statistics under ten subject heads for each of the twenty or so countries treated, and there is a gazetteer.

N. N. LEWIS

VEGETATION MAPS

From 16–20 May 1960, a colloquium organized by the "Centre National de la Recherche Scientifique" on the methods of the cartography of vegetation was held at Toulouse. Twenty specialists discussed the facts to be mapped, and the compilation, reproduction and circulation of vegetation maps.

Among those who took part in these discussions were: MM. R. Tuxen, Director of the Bundesanstalt für Vegetationskartierung at Stolzenau-Weser; F. R. Fosberg, Pacific Vegetation Project, National Research Council, Washington; L. Dudley Stamp, Director of the World Land Use Survey; V. Sochava, Institute of Botany, Leningrad; L. Emberger, Director of the Service de la Carte des Groupements Végétaux, Montpellier; Mlle M. Foncin, Conservateur-en-Chef, Bibliothèque Nationale; MM. H. Gaussen, Director of the Carte de la Végétation, Toulouse; G. Laclavère, Inspecteur Général Géographe, Institut Géographique National, and A. Libault, École Supérieure de Cartographie.

An exhibition of maps, mounted in the new quarters of the Service de la Carte de la Végétation, where the meetings were held, allowed the study of the representation of vegetation on old French maps exhibited by the Bibliothèque Nationale, the Institut Géographique National and the Administration des Eaux et Forêts, and on modern maps prepared by various countries. A field excursion in Les Corbières and the Plateau de Sault by the Ande and Ariège valleys gave an opportunity of examining in detail afforestation in the forest of Rialsesse and the Pinet peat bog, and of learning the working methods which M. Gaussen and his colleagues are able to follow in the field, thanks to a laboratory truck specially fitted with ingenious equipment. At the end of the conference, various resolutions were adopted with the object of securing international agreement on terminology, choice of scales and colours for vegetation maps.

M. FONCIN

A MAP OF MOUNT McKINLEY, ALASKA

For some twenty years Dr. Bradford Washburn has been working on the Mount McKinley area, with the hope that a large-scale map of the mountain in the best tradition of Swiss alpine cartography might result. This hope has now been fulfilled with the issue by the Swiss Foundation for Alpine Research of the handsome portfolio "Mount McKinley, Alaska" (Bern, 1960). This contains what is modestly termed a reconnaissance topographic map by Bradford Washburn based upon photographs taken around, on and over the mountain in the course of seven expeditions between 1945 and 1960. The map, on the scale of 1:50,000, was plotted from the photographic plates on Wild stereoplotting machines, and executed in the fine style of Swiss mountain cartography; glaciers and perennial snow in blue, rock-work in a darkish brown, relief shading in a bluish grey, and grass and moss in green. Though described as a reconnaissance map, the standard of accuracy is high over much of the area, and it fits well with adjacent work of the U.S. Geological Survey. This striking sheet is the result of remarkable international cooperation; the U.S. Air Force, particularly the Alaskan Air Command, carried out the flights for the vertical air photographs, the U.S. Geological Survey prepared the plates, the Coast and Geodetic Survey computed the data, the firm of Wild plotted the plates, and officers of the Swiss Federal Institute of Topography executed the rock-drawing and the relief shading. Inspiring the whole project was Dr. Othmar Gurtner, at the time of his death Director of the Swiss Foundation which, with the Museum of Science, Boston, sponsor the map, and it is to Dr. Gurtner's memory that the map is dedicated. The portfolio also includes descriptive and explanatory pamphlets, and four photographic prints of the mountain, which it is very instructive to study in conjunction with the cartographic representation. Dr. Washburn and all his associates deserve congratulations on this excellent result of their cooperation.

G. R. CRONE

EARLY AERONAUTICAL CHARTS

To mark the fiftieth anniversary of the first specialized chart for use by the airman, Dr. W. W. Ristow has published a greatly enlarged second edition of his "Aviation cartography; a historico-bibliographic study of aeronautical charts" (Library of Congress: Map Division, Reference Dept., Washington, 1960. $1.50). Over 750 references are listed, in many cases with short annotations. In his introduction, Dr. Ristow shows that the earliest advocate of special aeronautical maps was the German officer and balloonist, Hermann Moedebeck, who pointed out the potential value of aeronautical charts as early as 1888, and whose efforts resulted in the establishment of an International Commission for Aeronautical Charts in 1907, and in the publication two years later of the first true air chart on the scale of 1:300,000. Moedebeck had, of course, mainly lighter-than-air machines in mind; it was the advent of powered flight that gave the impetus to air cartography. The Index records only one minor reference to the Royal Geographical Society, the indexer having overlooked item no. 546 in the list, an extensive summary of an important paper by Karl Peucker, and no. 290, a note on the Brussels meeting of the International Aviation Map Commission in May 1911. It might be concluded, therefore, from a perusal of the Index, that the Society had displayed no interest in this important subject at a critical time in its development.

G. R. CRONE

THE HYDROGEOLOGICAL MAP OF THE FEDERAL REPUBLIC OF GERMANY

In view of the increasing demand for ground-water by industry and by the increasing population, and the decrease of the ground-water resources of the Federal Republic, it was necessary to investigate the natural distribution of ground-water sources, and wells in the Republic's territory. "Hydrogeologischer Arbeitskreis," chairman Prof. R. Grahmann, was formed, in cooperation with the Ministry of Economics, to map these ground-water conditions. With the active aid of the geological offices of the Länder (Geologische Landesämter) there was published from 1953 onward a map, "Hydrogeologische Übersichtskarte," on the scale 1:500,000 on the base of the former Vogel Karte 1:500,000. The cartography was executed by the Bundesanstalt für Landeskunde, Bad Godesberg, from whom it may be obtained. The whole set comprises fourteen sheets, and contains geological formations according to their yield of ground-water, ground-water levels, sources, mineral waters, waterworks and conduits, as well as dates of supply. There are annexed to the explanations for each sheet maps of the mean yearly and winter precipitations on the base of fluvial basins, elaborated by Prof. Keller and his collaborators. As a summary, Prof. Grahmann compiled a hydrogeological map covering the whole territory of the Federal Republic on one sheet at the scale 1:1,000,000; it is an interesting attempt to combine the geological symbols for the rock formations with those of ground-water capacity. This map has been published with an explanatory text* which also contains maps at 1:1,000,000 dealing with the ground-water, the precipitations according to fluvial basins, and the mean heights of off-flow for special periods, thus giving data for the amount of ground-water available, as well as data for its natural restoration.

E. MEYNEN

* Forschungen zur deutschen Landeskunde. Veröffentl. der Bundesanstalt für Landeskunde. Bd 103. R. Keller: Der mittlere Niederschlag in den Flussgebieten der Bundesrepublik Deutschland.—Bd 104. R. Grahmann: Die Grundwässer in der Bundesrepublik Deutschland und ihre Nutzung. Bd 105. W. Wundt: Die mittleren Abflusshöhen und Abflussspenden des Winters, des Sommers und des Jahres in der Bundesrepublik Deutschland.

THE SOCIETY'S NEWS

NEW FELLOWS OF THE SOCIETY

Two recent elections to the Society's Fellowship are of interest. The Right Honourable Viscount Slim, K.G., G.C.B., G.C.M.G., G.C.V.O., G.B.E., D.S.O., M.C., Governor-General and Commander-in-Chief of Australia from 1953 to 1960, was elected in June 1960. The Right Honourable Lord Casey of Berwick and Westminster, P.C., C.H., D.S.O., M.C., for many years Commonwealth Minister for External Affairs and in close touch with Australian Antarctic exploration, was elected in October 1960.

GENERAL CERTIFICATE OF EDUCATION: GEOGRAPHY PRIZES

The Society's annual award of prizes for geography based on the results at Advanced and Scholarship levels in the General Certificate of Education summer examinations has been made, on the recommendations of the respective Boards of Examiners:

Oxford Local Examinations: Violet Anne Spence, Girls' High School, Loughborough. *Oxford and Cambridge Schools Examinations:* Marigold Hunter, Rickmansworth Grammar School. *Durham University Schools Examinations:* Margaret A. Megoran, Chester-le-Street Grammar School. *Welsh Joint Board:* John Brian Breese, Newtown Boys' High School. *London University Schools:* Sarah C. E. Bloomfield, Henrietta Barnett School. *Joint Matriculation Board:* Glennis C. Fowler, Crewe County Grammar School. *Northern Ireland Senior Certificate Examinations:* Robert J. Moore, Grosvenor High School, Belfast. *Cambridge Local Examinations:* Robin A. Farbridge, Sudbury Grammar School. *Southern Universities' Joint Board:* No award.

THE RECORD

CONTRIBUTORS TO THIS ISSUE OF THE *JOURNAL*

Eric Shipton, who was awarded the Society's Gold Medal in 1938 for his explorations in the Shaksgam River basin, has made two expeditions to the Andes of southern Patagonia, and is about to start on a third. *C. T. Smith* is a lecturer in the department of geography at Cambridge. *David Lowenthal* is a Research Associate of the American Geographical Society; he is the author of 'George Perkins Marsh, versatile Vermonter,' reviewed on p. 539 of this *Journal*. *Professor Stanislaw Leszczycki* is Director of the Institute of Geography in the Polish Academy of Sciences and Professor of Geography in the University of Warsaw. *Professor K. C. Edwards* is Professor of Geography at Nottingham University; *Mr. G. R. Crone* is Librarian and Map Curator of the Royal Geographical Society. *Dr. T. M. Johnstone* is a lecturer at the School of Oriental and African Studies; *J. C. Wilkinson* is a geographer employed by the Qatar Petroleum Company, Ltd. *Dr. W. H. Melbourne*, who graduated from Adelaide University, was, at the time of the expedition engaged on post-graduate research on aeronautics at the Imperial College of Science. *R. Gerard Ward* is a lecturer in the geography department of the University of Auckland, and will be taking up an appointment at University College London early in 1961. *C. W. Mitchell* and *P. E. Naylor* are both on the staff of Hunting Technical Services, Ltd. *Professor Sir Charles Cotton* is Emeritus Professor of Geology, Victoria University of Wellington, New Zealand; he was awarded the Victoria Medal in 1951. *Dr. E. M. Yates* is a lecturer in the geography department of King's College in the University of London. *J. P. O'F. Lynam* is a Civil Engineer, spare-time mountaineer and geographer. *Major E. J. E. Mills, R.A.S.C.*, now at the Staff College, Quetta, Pakistan, has been on mountaineering expeditions in Alaska, the Himalaya and in the Ruwenzori; *Dr. J. D. Kinloch*, who is on the staff of the Royal Infirmary, Glasgow, has climbed in the Alps, the Pyrenees, Yugoslavia and Norway, in addition to Alaska. *R. J. Price* is a post-graduate student in geography at the University of Edinburgh.

H.M. the King of Nepal at the Society on 31 October 1960, with Councillor Robert Everest, Mayor of Westminster, and of the same family as Sir George Everest after whom the mountain was named

THE MEETING OF THE BRITISH ASSOCIATION 1960

The 122nd meeting of the British Association was held in Cardiff in the impressive setting of the striking Civic Centre in Cathays Park. The total attendance of over 4100 has only rarely been equalled in the history of the Association. Section E met in the University College of South Wales and Monmouthshire under the Presidency, appropriately in the capital city of Wales, of a Welshman, Professor E. G. Bowen. The Section welcomed as its guest throughout the meeting Professor K. Dziewoński of the Academy of Sciences, Warsaw, a Polish geographer well known to many members of the Section through his distinguished work at the Anglo-Polish geographical seminar at Nieborów in 1959.

The Section proceedings opened on Thursday September 1, in customary fashion, with a series of contributions to the geography of the Cardiff region. Dr. Margaret Davies gave an illustrated survey analysing the varied landscapes of the area between the Wye and Bridgend and between the Bristol Channel and Brecon. Professor S. H. Beaver examined the role of the canal and transport systems in the industrial development of the eastern part of the South Wales coalfield. Mr. H. W. E. Davies and Mr. D. F. Hagger, graduates of the London School of Economics working in the Planning Office of Glamorganshire County Council, discussed post-war changes in employment and industry in South Wales and, using an original technique, offered a challenging division of South Wales into areas of growing, static or declining importance. A noteworthy feature of the Section meetings was the excellent attendance at field excursions. The Thursday afternoon excursions were led to Cardiff Docks and to Guest, Keen Iron and Steel Co. Ltd. by Dr. Margaret Davies, and to the Vale of Glamorgan by Professor Bowen and Mr. H. Carter.

Professor Bowen's Presidential Address, given on Friday September 2, and entitled "Welsh emigration overseas," proved to be an examination of the results and importance of Welsh emigration overseas as seen from a world geographical viewpoint. The Section then had the privilege of hearing the "Lister Lecture," one of three named lectureships recently endowed by the Association to afford young scientists the opportunity to explain and discuss their research work. On this occasion Mr. W. M. Williams of the University College of North Staffordshire discussed the approach and methods of the social geographer in a lecture entitled "The social study of family farming."

The Friday afternoon meeting took the form of a joint discussion with Section H (Anthropology), under the Chairmanship of Lord Rennell of Rodd, on "Leadership in rural societies." The papers read were by Mr. J. B. Caird and Mr. H. A. Moisley on "Leadership and innovation in crofting communities of the Outer Hebrides," Miss Rosemary Harris on "Leadership in a border community in Northern Ireland," Mr. M. Kirk on "The suburban community in the countryside," and Mr. D. Jenkins on "Leadership and change in a rural community (south Cardiganshire)."

An extensive programme of excursions had been arranged for the weekend. On Saturday, Professor A. Austin Miller led a party to study the geomorphological features of the lower Wye, Miss G. E. Groom led another geomorphological expedition to the Brecon Beacons and Mr. G. Manners demonstrated some of the impressive features of the industrial landscapes of the Swansea region. On Sunday three field parties studied respectively the geography of the Gower peninsula (leader—Dr. S. H. Cousens), the historical geography of the Forest of Dean (Mr. Frank T. Baber) and the steam coal section of the South Wales coalfield (Dr. Melvyn Howe).

Monday was an unusual day in the history of the British Association for all the fifteen sections joined together for a joint discussion on the world food and population problem. The proceedings of this symposium have been printed in full elsewhere*; here it needs only to be stated that a geographical approach to the problem was well put by Professor L. Dudley Stamp. During the afternoon, in addition, a group of members of Section E made a profitable study of the geomorphological features of the southern border ridges of the coalfield under Mr. J. R. Cooper's leadership.

* *Nature* **188**, 4744 (1 Oct. 1960).

The Section Dinner was held on Monday evening in the Royal Hotel, Cardiff, in the celebrated room in which, on Monday 13 June 1910, Captain Scott attended his last public function before sailing from Cardiff in *Terra Nova* on his last voyage to the Antarctic. Mr. and Mrs. F. Blaise Gillie and Professor Dziewoński were the principal guests. It was also pleasant to see once again at Section E functions Professor and Mrs. H. J. Fleure who, incidentally, celebrated their golden wedding during the meeting.

On Tuesday morning Professor D. L. Linton presented some of the results of his recent work in the Falklands Islands Dependencies in a paper entitled "Some scenic contrasts in the Antarctic dependencies of the Falkland Islands." Mr. E. Derbyshire discussed "The degree of ice inundation in upland England and Wales during the last Glacial period," and Mr. E. M. Driscoll examined "Glacial drainage in the Vale of Glamorgan." Two afternoon excursions were led by Professor Beaver to study the railway geography of south-east Wales and by Mr. P. Jones and Dr. M. Howe to the Clydach Gorge and Mynydd Llangatwg.

The Section programme concluded on Wednesday morning with four papers. Dr. Melvyn Howe gave an account of his recent work in medical geography on the regional variations of disease mortality in England and Wales. Mr. G. R. J. Jones propounded a new thesis on the origin of the nucleated villages of the English Plain, suggesting that a great many of these settlements were already in being as hamlets in the early Iron Age. Dr. P. D. Wood discussed examples of surviving morphological elements in some Welsh Border towns originating in periods of political stabilization of the Anglo-Welsh frontier, and Mr. Harold Carter put forward a new scheme for the analysis of Welsh townscapes.

The Section meetings may be counted profitable and successful and they demonstrated once again the importance of the principal roles of Section E in presenting advances in geographical techniques and studies to audiences composed not only of geographers but of students of all the principal sciences, and of providing opportunities for joint public discussions between geographers and other scientists. In this connection it may be added that the 1960 meeting saw the birth of a new Section N, Sociology. The introduction of sociology into the Association brings with it new possibilities for joint discussions in the field of human geography.

No account of the meeting of Section E would be complete without a note of appreciation of the excellent administrative arrangements made by the Local Secretary, Dr. Margaret Davies, and her assistants. Dr. Davies also made an important contribution to the regional survey, 'The Cardiff Region,' which forms a fitting addition to the series of post-war surveys that have added greatly to the literature of the regional geography of the British Isles.

Professor S. H. Beaver has been elected President of Section E for the 1961 meeting which will be held at Norwich from August 30 to September 6. Professor M. J. Wise and Dr. J. W. Birch have retired from office, as Recorder and Secretary respectively, on completion of five years' service. The new Recorder is Mr. N. Stephens. Dr. S. R. Eyre and Mr. H. A. Moisley have been appointed as Secretaries. Offers of papers for reading at the Norwich meeting will be welcomed and should be sent immediately to Mr. Stephens at the Geography Department, Queen's University, Belfast.

M. J. WISE

XIX INTERNATIONAL GEOGRAPHICAL CONGRESS, STOCKHOLM

Meetings of the Xth General Assembly of the International Geographical Union, and the XIXth International Geographical Congress, were held in Stockholm from 5 to 13 August 1960. Dr. Edward Hindle, F.R.S., attended as leader of the British delegation and Professor K. C. Edwards as deputy leader. The Congress was attended by representatives of sixty-five countries, the most notable absentees being the Chinese Republic and Taiwan. The national committees of the countries of Norden—Denmark, Finland, Iceland, Norway and Sweden—representing the "host of countries," were responsible for the local arrangements, which included a series of very well-organized excursions and symposia both before and after the Congress.

An exhibition of thematic maps and national atlases from various countries had been assembled and was shown in the Norra Latin School, and included a British exhibit prepared at the request of the British National Committee for Geography, by a committee at the R.G.S. with a descriptive catalogue by Mr. G. R. Crone.

The opening ceremony was held in the Folkets Hus Congress Hall, on August 6, and was attended by more than 2000 members and guests, when the President of the Congress, Professor Hans W:son Ahlmann, welcomed the delegates on behalf of the Norden countries. This was followed by a General Assembly meeting of the I.G.U. and in the evening there was an Official Reception by the City of Stockholm in the Town Hall. The following days, from August 7–13, were devoted to working sessions held either in the Folkets Hus, or in the Norra Latin School, the Departments of Geography, University of Stockholm, or the Stockholm School of Economics. The final social gathering took place on Friday, August 12, when a banquet was held in the Town Hall, followed by an exhibition of local folk dances by students. Lord Nathan spoke on behalf of the foreign delegates and visitors and thanked the local authorities for their generous hospitality during the Congress.

The General Assembly meeting and closing ceremony was held in the Folkets Hus on 13 August 1960. At this meeting various countries were admitted members of the I.G.U., including the East German Democratic Republic. It was agreed that the International Cartographic Association (I.C.A.) should be incorporated as a special Commission of the I.G.U. and the statutes of the I.G.U. were being reviewed to make this possible. In addition the Congress warmly welcomed the proposal that the United Nations should invite interested countries to attend a Conference for the revision of the 1:1 M. International Map of the World, in London, during July 1961. It was also recommended that member countries should endeavour to complete their respective sections of the map.

The Congress accepted, with acclamation, the invitation conveyed by the British delegate that the XXth International Geographical Congress should be held in the United Kingdom during 1964. Professor Carl Troll, of the University of Bonn, was elected President of the Congress, by an overwhelming majority.

INTERNATIONAL CONGRESS, LISBON, 1960

The Society was represented by Sir James Marshall-Cornwall, immediate Past President, at the International Congress for the History of Discoveries to celebrate the Fifth Centenary of the death of Prince Henry the Navigator. The Congress was held in Lisbon between 5 and 11 September 1960. Mr. G. R. Crone, Librarian and Map Curator, attended the Congress as a guest of the Portuguese Government.

The Congress, initiated and sponsored by the Portuguese Government, was held in the recently built Faculty of Letters in the new University City in the northern outskirts of Lisbon, near Portela airport. The Secretary-General was Dr. Moreira de Sà. There were about 200 foreign delegates present, and several hundred ordinary members. About twenty British attended; the other countries most strongly represented were Brazil, the United States and France. The Congress was divided into two sections: "History of the Discoveries" and "Overseas Expansion," and these into several sub-sections; Sub-section I of the first Section dealt with historical cartography, the chairman being Dr. Armando Cortesão. Summaries of papers received were available to members, and, in most sections, simultaneous translations in Portuguese, French and English was provided. It was not always very easy to discover the programme for the day, and several sub-sections had too many papers to allow adequate discussion. The sub-section on cartography, however, was notably well organized, and some valuable discussions resulted.

The Congress was most hospitably entertained at various functions by the Government and the City of Lisbon, and two all-day excursions were organized, one to Batalha and Alcobaça to visit the tombs of Prince Henry and his parents, the other to the Jerónimos Monastery, the Torre de Belém and Sintra. Members also had the opportunity to visit two exhibitions, one at Belém on the history of the discoveries, which

was remarkably well mounted, and a historical exhibition of maps of the Portuguese colonies in the Artillery Museum. A large number of publications were presented to members; a note on these will be given in a subsequent issue of this *Journal*.

NEW LAND USE SURVEY OF BRITAIN, Progress Report: September 1960

The new land use survey which was announced in the *Geographical Journal* for March 1960 has made substantial progress during the summer of 1960, and 75 per cent. of England and Wales has now been undertaken by volunteer surveyors. Nearly a thousand volunteers have taken on responsibility for specific maps and, as many of them are being assisted by teams of students and sixth-formers, the total number of people who are giving practical support to the project is very considerable.

Many completed field maps are expected at the Survey office, at King's College, London, during the autumn of 1960. The first of these were received during September, and by the end of that month the completed and submitted areas totalled approximately 1400 square miles.

The printing of two pilot areas, the Crowland Fens and the Princes Risborough district of Buckinghamshire, is now in hand. The former intention to begin by printing the original pilot maps of East Kent has had to be postponed, as the Ordnance Survey is currently revising this area, and cannot make the necessary kodaline transparencies available at present. It is hoped that the first maps will be available early in 1961. They will be equivalent in size to two $2^{1}/_{2}''$ Ordnance Survey sheets, and will cost 11*s* each.

Several university departments have generously offered draftsmen's services for the reduction of the 6″ field maps to the scale of 1:25,000, in readiness for the printer.

A number of people have kindly agreed to act as county or regional organizers for the Survey. They are:—

Anglesey ..	Miss M. McCririck, St. Mary's College, Bangor.
Berkshire ..	Mr. P. Thorpe, 3, Langley Hill Close, Tilehurst, Reading.
Birmingham ..	Mr. P. Bailey, Saltley College, Birmingham, 8.
Brecknockshire	Dr. J. C. Grove, Brecon Grammar School, Brecon, Wales.
Devon ..	Mr. D. Brunsden, King's College, Strand, London, W.C.2.
Durham ..	Mr. J. Dewdney, Department of Geography, The University, Durham.
Essex ..	Dr. Clayton, London School of Economics, London, W.C.2.
Hampshire ..	Mr. Dobson, King Alfred College, Winchester.
Lancashire, Wales as a whole	Dr. J. A. Taylor, Department of Geography, University College, Alexandra Road, Aberystwyth.
Leicestershire	Professor Pye, The University, Leicester.
North Riding	Mr. J. Soulsby, Department of Geography, Leeds University.
Northumberland	Dr. House, The University, King's College, Newcastle-upon-Tyne.
Shropshire ..	Mr. J. Phillip Dodd, Hampton Loade, Alveley, Bridgnorth.
Wiltshire ..	Mr. Gardner, The Flat, Moffatt House, London Road, Marlborough.

A new phase of recruiting volunteer surveyors is now opening. It is hoped to find 300–400 people who will undertake the remaining quarter of England and Wales during 1961. Help is still required in every county except Anglesey, Brecknockshire, Hampshire, Leicestershire, Middlesex and London. Counties which have only a few blank sheets are:—

Bedfordshire ..	TL.04, 15
Berkshire	SU.29, 36, 96
Buckinghamshire ..	SU.79. SP.61, 90 (part)

Cheshire	SJ.87, 97
Derbyshire	SK.35, 45
Durham	NZ.02 (part), 12
Essex	TM.00, 01 (part). TL.81 (part), 83, 84
Herefordshire ..	SO.32, 42, 52, 55, 56, 65
Hertfordshire ..	TL.32 (part), 33 (part), 42, 43
Kent	TQ.95
Nottinghamshire ..	SK.55, 65, 66, 74, 76, 79, 87
Rutlandshire ..	TF.91
Shropshire	SJ.22, 23, 32, 53, 63, 71
Staffordshire ..	SJ.92. SK.03 (part)
Surrey	SU.96. TQ.06
Sussex	TQ.02, 81, 82. SU.92
Warwickshire ..	SP.24, 34, 35, 45
Wiltshire	ST.73, 82, 83, 86, 92.
Worcestershire ..	SO.66, 86, 94.

Potential surveyors, and other interested people, should write to Miss Alice Coleman at King's College, Strand, London, W.C.2. Land Use Survey handbooks can be obtained from Miss Coleman, price *2s 6d*

THE SECOND EUROPEAN CONGRESS OF RURAL SOCIOLOGY

From 1–6 August 1960, over 200 delegates from fourteen European countries assembled at the Agricultural College of Norway, Vollebekk, some 20 miles south of Oslo, for a congress held as one session with no subsections; simultaneous translation was provided in English, French and German. The opening session dealt with rural social organization, the main theme of the congress, and a day's work was given to each of three topics—the changing structure and functions of rural communities, rural organizations in a changing society, rural occupational structure and labour organization. For each of these topics some ten or eleven papers had been prepared by people from a number of countries: these were reviewed by a rapporteur and a co-rapporteur who on one day in particular became a contra-rapporteur with stimulating effect. The writers of the papers were given the opportunity of speaking first in the discussions. Perhaps the great merit of the congress was its cohesion, accentuated by its location in the deep countryside.

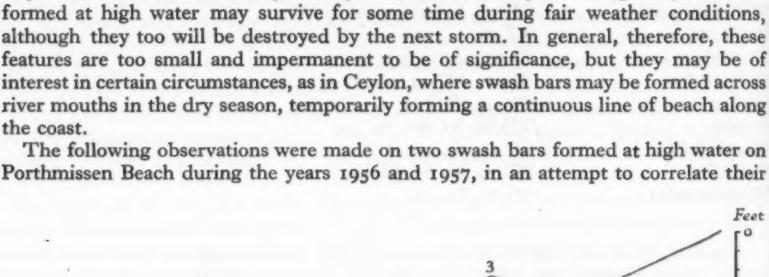
The interplay of ideas was fruitful. As at the Louvain congress two years earlier, the keynote was realism: the President, Professor E. W. Hoftsee, of the Agricultural University of Wageningen, in his address argued that formal social organization was essential to the mental security of people in a large and complicated world: no longer could the farmer belong only to a local rural, or village society because the rural man had to live in an expanding social world, and so inevitably becomes "more and more like the city-dweller." On this same theme, Dr. G. P. Wibberley showed that distinctions between urban and rural communities were becoming blurred, and that migration from rural areas was inevitable with consequent changes in population distribution and the composition of farming families. Under such compulsive circumstances, the structure of rural organizations must change, and so too must the form of government as public services penetrate the remotest recesses of the countryside. Many examples were given from various countries of the spread of industrial workers and of industries into rural areas, and this social change was abundantly seen during the day excursion in South-east Norway. Any geographer interested in rural areas could derive profit from membership of the European Society for Rural Sociology, and perhaps contribute to its journal, *Sociologia Ruralis*, which is edited by Dr. G. P. Hirsch, Agricultural Economics Research Institute, Parks Road, Oxford. The general secretary of the Society is Dr. H. Kötter, Nussallee 21, Bonn, Germany.

T. W. FREEMAN

SOME OBSERVATIONS ON SWASH BARS, PORTHMISSEN BEACH, TREVONE, NORTH CORNWALL

The name "swash bar" has been given to small sand ridges formed on beaches at high or low water by the action of constructive waves.* During the period of still-stand experienced at these times, it is apparent that if material is being moved shorewards, it will accumulate at the limit of the run-up of the waves. Bars formed in this way at low water are invariably destroyed when covered by the rising tide; but those formed at high water may survive for some time during fair weather conditions, although they too will be destroyed by the next storm. In general, therefore, these features are too small and impermanent to be of significance, but they may be of interest in certain circumstances, as in Ceylon, where swash bars may be formed across river mouths in the dry season, temporarily forming a continuous line of beach along the coast.

The following observations were made on two swash bars formed at high water on Porthmissen Beach during the years 1956 and 1957, in an attempt to correlate their



Profiles of the 1956 bar: 1. July 29: original shape as formed by lower frequency swell. 2. August 7: backslope developed during migration under higher frequency swell. 3. September 7: final position at stage of maximum growth

formation and movement with varying wave conditions. The beach, which faces north-west, stretches for about 350 yards from the head to the mean low water mark and has an average width of about 150 yards. Since the tidal range varies from over 20 feet at springs to 9 feet at neaps, the position of the high water mark varies considerably. Under fair-weather conditions only the higher spring tides cover the entire beach and the average minimum neap tides leave the top third uncovered. The lower spring tides reach approximately midway between the neap high water mark and the head of the beach. In July 1956 a bar developed on the south side of the beach during the maxima of the lower spring tides. Before it was destroyed in the first week of October, it had migrated 100 feet further up the beach, and on two occasions small subsidiary bars were formed on the seaward slope. The following April a bar developed on the north side of the beach during minimum neaps, but was destroyed after three days. The survival of the 1956 bar until October was largely a result of its position so far up the beach.

The formation of the bars, and the more important subsequent changes of the 1956 bar, took place under the action of long distance swell waves. These conditions, with 1–2 foot high waves, were frequently experienced over considerable periods when the wind was less than Force 4. As recorded in the bay, the wave lengths varied from 20 to 60 yards. In each case, bar formation occurred under the action of the longer waves of 40 yards or more with frequencies between 6 and 8 per minute. The shorter waves

* Cf. C. A. M. King and W. W. Williams, "The formation and movement of sand bars by wave action," *Geogr. J.*, 103 (1949) pp. 81–2.

with higher frequencies often reaching 10 to 12 per minute were responsible for the most marked periods of migration of the 1956 bar. Larger waves with heights of 3 feet or more were too strong to be guided by the shape of the bar and their effect was invariably destructive.

Neither the 1956 main bar, nor the 1957 bar, may be said to have formed in a single tide. In both cases low frequency swell conditions persisted during a succession of tides of only slightly varying heights, so that swash action continued to be active over the same area of the beach at each successive high water. Thus the 1956 bar developed during the five tides marking the maxima of the lower spring tides—21·0, 20·1, 21·0, 20·2, 21·0 ft. above O.D.*—and the 1957 bar developed during three neap tides of slightly varying heights—16·8, 17·1, 16·9 ft. above O.D. It is thought, therefore, that although the first subsidiary bar in 1956 was pushed up the seaward slope of the main bar by increasingly higher tides, and the second formed in a single tide, suitable wave conditions must coincide with a series of tides of similar height for a bar of appreciable size to form on Porthmissen Beach. Thus swash bars are most likely to form during the neap and lower spring tides.

Although both swash bars developed under almost identical wave conditions they were quite different in shape. When first formed, the 1956 bar had a steep seaward slope (gradient about 1 in 12), which was divided from a flat upper surface by a marked angle (see diagram). Near the cliff it was 3–4 feet high, but became lower and less well defined across the beach until it merged into the general beach profile about 150 feet from the cliff. Subsequently, under the action of the shorter, higher frequency swell, it developed a marked backslope, transforming the original angle into a definite crest. These waves tended to break on the seaward slope, stirring up the sand which was transferred over the crest to the backslope. In this way both slopes were steepened and the bar migrated up the beach. The two subsidiary bars were too small for their shape to be significant.

In contrast, the main feature of the 1957 bar was a steep landward face which was about 1 foot high near the north cliff and distinguishable for about 200 feet out across the beach. The upper surface of the bar rose gently seaward in a convex crest which merged into the lower beach profile. This form corresponds closely with the swash bars considered by King and Williams.† The landward face developed during the third tide as a delta formation in the water accumulating behind the growing hump of sand. Once initiated, the face itself formed a barrier to returning water and perpetuated the conditions which allowed its growth. A small lagoon was left behind the cliff end of the bar when the tide fell.

The evidence is insufficient to suggest an explanation for this difference. Although the 1956 bar was unusual in position and shape, bars showing the same characteristics as the 1957 bar have frequently been observed on Porthmissen Beach in previous years. These could have been swash bars formed at neap high water, which subsequently extended across the beach. The landward face is seldom more than 2 feet high although, notably in April 1958, it may grow to as much as 4 feet at the north end. This particular bar extended almost as far as the south cliff but, despite its size, was destroyed in a single tide in mid-May.

Acknowledgment.—My thanks are due to Mr. W. M. Lindley of Trevone for his help in keeping records of wind and wave conditions.

E. D. ANDREW

HUGH ROBERT MILL: AN AUTOBIOGRAPHY

The small remaining stocks of the autobiography of the late Dr. Mill, who was for many years Librarian of the Royal Geographical Society, are being offered to libraries and any individuals who may be interested. One shilling and sixpence to cover postage should be sent to Messrs. Longmans Green & Co., The Pinnacles, Harlow, Essex.

* Tide heights calculated for Padstow from the Admiralty Tide Tables.
† *Op. cit.*

NOTES

The Royal Institute of Chartered Surveyors held an Annual Conference at Bangor, North Wales, on 1 September 1960, at which an address was given by Dr. R. J. Adie, who is in charge of the Geology Department of the Falkland Islands Dependencies Survey. Dr. Adie spoke on "The geological history of Antarctica."

* * *

Notice has been received from the Department of Geography at the University of Aberdeen that Tarradale House, once the home of Sir Roderick Murchison, is to be opened as a centre for field studies. Tarradale House stands by the shores of the Beauly Firth some 16 miles by road north and west of Inverness, and is in an ideal situation as a centre for studying both the highlands and the lowland country around the Moray Firth. It will also be available for small conferences, and further particulars of accommodation and costs may be obtained from the Department of Geography at Aberdeen.

* * *

The University of Alberta announces the establishment of The Boreal Institute, the object of which is to acquire and disseminate knowledge of the North. During 1960–1 the Institute will be concerned chiefly with organization details, and seeks to make contact with similar institutes and interested individuals. Material of all types concerning the North will be welcome for the Institute's Information Centre. Correspondence should be addressed to The Boreal Institute, University of Alberta, Edmonton, Alberta.

* * *

The Ohio State University has founded an Institute of Polar Studies, of which the address is 125, South Oval Drive, Columbus 10, Ohio, U.S.A. The new Institute's "area of concern" is described in a circular dated March 1960 as being "The environment where ground is permanently frozen or glaciers are nearby," and a variety of scientific subjects are to be studied.

* * *

The Hydrobiological Research Unit of Khartoum University has published its sixth Annual Report (July 1958–June 1959), edited by L. Berry, senior lecturer in physical geography. The report is largely devoted to the problem of the water hyacinth (*Eichhornia crassipes*) on the Nile, a subject already treated by Mr. Berry and Dr. P. A. Gay in the *Geographical Journal* **125**, 1 (1959) pp. 90–1. A further article by H. R. J. Davies, also of the University of Khartoum, was published in *Nature* **184** (1959) pp. 1085–6, in which the presence of *Eichhornia* is noted on the Sobat, and its effect on the fishing techniques of the Nilotic peoples is discussed.

* * *

The first Annual Report of the Cambridge University Underwater Exploration Group has been received in the Library. The Group is a branch of the British Subaqua Club and has had support in its various activities from the Society, and also from the British School at Athens and the Department of Classical Archaeology, Cambridge. The Group organized the Apollonia expedition of 1958 and the Syracuse and Apollonia expedition of 1959: it also sent a team to Syra Island in the Aegean, to Naples and to the Epidaurus, and has undertaken underwater research on behalf of the National Institute of Oceanography. In addition to continuing its archaeological and zoological work in Mediterranean and British waters, the Group hope to train a coastal research team to tackle problems of beach erosion and building, under the guidance of interested university and government bodies in this country.

* * *

Two useful bibliographies have been received from Kyoto, Japan: 'Contents and index to the *Himalayan Journal* (1929–1958)' compiled by Eizo Suwata and Yoshimi

Yakusha, and 'Selected index of reports on Himalaya, Tibet and Central Asia to the *Geographical Journal* (1893–1959),' compiled by Yoshimi Yakusha.

* * *

The NORTHERN UNIVERSITIES GEOGRAPHICAL CONFERENCE, one of the less publicized events in the geographical calendar, has instituted a new *Journal* (Vol. 1, February 1960, pp. 92) to provide a permanent record of its annual gatherings. The purpose of the journal is to provide students with a medium in which they can publish succinct accounts of their research. The nine contributors, all from different universities, offer two field investigations (on Land's End valley development and the local climate of a hill mass), four economic studies (Nottingham's lace industry, government-assisted industry in Northern Ireland, the china clay trade and building development in Leeds), two historical essays (canals in north-east England, and regional variations in the agriculture of medieval England) and one overseas topic (Middle West air masses).

* * *

Since 1951, the SCOTTISH FIELD STUDIES ASSOCIATION (c/o Dept. of Botany, University of Glasgow) has operated a Field Centre at Garth Memorial Youth Hostel near Glen Lyon, Perthshire. It is the policy of the Association to include an article on some aspect of Garth in its Annual Report. That for 1959 deals with the geography of the Garth area—"the central highlands in miniature," as Joy Tivy describes it. The article is based on work done in the field by study groups and is testimony to Dr. Tivy's enthusiasm for the area.

* * *

OBITUARY

H. ST.JOHN B. PHILBY, 1885–1960

When St.John Philby died suddenly at the age of seventy-five in Beirut on Friday, 1 October 1960, on his way back from London to Arabia, the Royal Geographical Society lost one of its most distinguished explorers and a man of very remarkable character.

Philby was born on 3 April 1885 in Ceylon where his father, Henry Montague Philby, was a tea planter. After a distinguished scholastic career at Westminster and Trinity College, Cambridge, he entered the Indian Civil Service in 1907 and served in the Punjab, attaining a high standard in several oriental languages. In 1915 he went to Mesopotamia as a Political Officer, and served as Financial Assistant to the chief Political Officer, officiating Revenue Commissioner for occupied territories, Political Officer in charge of 'Amāra district and on special duty in Baghdad. He was made C.I.E. in 1917. During 1917–18 he was in charge of the British Political Mission to Central Arabia, and crossed Arabia from 'Uqayr to Jedda, exploring a large area in south-central Arabia and being the first European to visit the southern province of the Nejd. For this journey, which alone would have ranked him among the great travellers in Arabia, but which for Philby was only a beginning, he was awarded the Founder's Medal of the R.G.S. in 1920. He described this journey in 'The heart of Arabia' (1922). He returned to Mesopotamia in 1920 and served as adviser to the Ministry of the Interior until he went to Trans-Jordan in 1921 as chief British representative, a post he held until 1924. His journeys in central Arabia had, however, convinced him that the future of Arabia lay with Ibn Saud and not with King Hussein. Already in Mesopotamia he had quarrelled with Government policy and here in Trans-Jordan the friction continued. Philby was seldom tolerant of views which disagreed with his own. In 1925 he retired from the I.C.S. after visiting Jedda, which was then being besieged by Ibn Saud's forces, as a self-appointed intermediary between Ibn Saud and King Ali—to the embarrassment of H.M. Government. In 1926 he set up in business in Jedda as resident director of Sharqieh Ltd. In 1930 he declared himself a Muslim

and from then on lived mostly in Arabia where he became a close friend of King Ibn Saud. In 1931 he crossed the Rub' al Khālī, or "Empty Quarter," from north to south, a few months after Bertram Thomas had crossed it from south to north. He described his epic feat of desert exploration in 'The Empty Quarter' (1933). From 1932–7 he surveyed 'Asīr and the northern borders of the Yemen and described this further exploration in 'Arabian Highlands' (1952). In 1937 he made another outstanding journey between the Empty Quarter and the foothills of the Yemen, from Saudi Arabia to the Hadhramaut and back again, a journey which he described in 'Sheba's daughters' (1939).

These and his first Arabian journey in 1917–18 were Philby's major geographical explorations, the achievements by which he will best be remembered, especially by members of this Society. Although he made these journeys before the last War he never, in fact, stopped exploring. I lunched with him a few days before he died and he told me of his latest plans. Philby had known in full the satisfaction which an explorer feels from crossing an uncharted desert or from looking behind another range of mountains; he had experienced in full the disappointment which an explorer must feel when someone else beats him to his chosen goal: but Philby was more than an explorer, he was also a scholar fascinated by his adopted land. In consequence, Arabia did not lose its interest for him as it became better known. He who had solved so many of its major geographical problems was content in his later years to spend a week or more mapping some minor water-course or searching for ruins and inscriptions. Earlier he had been an enthusiastic collector of birds, mammals, plants, insects and rocks, of anything indeed which would add to the world's knowledge of Arabia, and his collections in the British Museum bear witness to the endless trouble he took over his specimens and the care with which he made his notes. Later in his life it was increasingly the past history of the land, recorded in inscriptions scattered about the desert and the empty hill sides, which absorbed his interest.

Philby wrote a number of books. His travel books are crammed with meticulously recorded observations which makes them invaluable as reference books but rather heavy reading. Other of his books, however, contain statements and charges which, to say the least, are unsound, for over politics he was curiously intemperate. Since his Mesopotamian days he had been strongly biased against the British Government and was always ready to attribute a sinister motive to their policy in the Middle East. To prove his point or to vindicate his judgement he was sometimes prepared to distort facts to suit his case. Such demonstrable inaccuracies will inevitably cause historians to question the soundness of his work, which is a pity for his life covered forty vital years of Arabian history. Geographers will, however, always be impressed by the accuracy of his maps, some of them made under conditions of the greatest possible hardship.

Philby's finest feat of exploration was undoubtedly his crossing of the Empty Quarter. Inevitably, one contrasts this achievement with that of Thomas, a comparison made the more interesting by the complete dissimilarity of the two men. I have sometimes wondered whether, if Philby had already crossed the Empty Quarter, Bertram Thomas would have undertaken the journey. Philby had certain advantages denied to Thomas. Once he had obtained Ibn Saud's permission to undertake the journey—and it was the King's delay in granting this permission which lost him the race—he had behind him the King's far-reaching authority. As a Muslim, with the backing of the widely feared Bin Jalawi, Governor of Al Hasā, he could pass safely through the territory of the powerful Ahl Murrah, whereas Thomas ran his greatest risk from this tribe, many of whom were extremely fanatical. Thomas had to make all his preparations himself—the Sultan of Muscat and his Wali in Dhufar were friendly, but their effective authority only extended a few miles inland. He discovered from experience which tribes could be of use to him, but as a Christian he was at first suspected and disliked. The measure of his achievement was that he won the confidence of these tribesmen and with no authority behind him persuaded them by patience and fair dealing to take him across the Sands. His object was to cross the Empty Quarter, a

feat which was generally assumed by Europeans to be impossible, and naturally he chose the easiest route where in fact the dunes were small, and the wells known to his Rashīd guides were comparatively frequent. Philby's route was far more difficult and the last part of their great journey was an amazing achievement, starting as he did with tired camels and men on the verge of mutiny, to cross a further 400 miles of waterless and unknown country through mountainous sands. There can be no doubt that his journey was the greater of the two, that it was indeed the greatest in the story of Arabian exploration.

I first met Philby in the summer of 1947 in Jedda, after I had travelled there through the Hejaz mountains from the Yemen border, through country much of which had previously only been seen by him. On my way there I had encountered several Arabs who had been with him. From their talk I got the impression of a man of tireless energy, quick-tempered and impatient of fools. It seemed that he had climbed every peak and spur along my route, most of them at midday when his companions wished to sleep. Although clearly they had frequently been exasperated, they spoke of him with considerable respect and often with affection, saying that he was very generous and never nursed a grievance. Philby showed an immediate interest in my journey and insisted on lending me various unpublished papers and maps of his to help me to prepare my own for the *Geographical Journal*. I saw him occasionally during the next few years whenever we were both in London. At the time I was travelling in the Empty Quarter and Philby, of course, was living in Saudi Arabia. I shall never forget the help and encouragement which he gave me during those years, nor the generosity with which he insisted on entertaining me. But best I remember a night we spent together in Laylá. A few days earlier he had by his intervention with Ibn Saud secured my release from prison, and he had then come down to Laylá from Riyadh to see that I was all right. We talked from sunset till nearly dawn. I had been distressed and shaken by the fanatical hostility I had encountered in the town. Philby that night was wise and very human. I realized then how great he was. As an Arabian traveller I shall always be proud to have followed in his footsteps.

WILFRED THESIGER

H. St.J. B. Philby was elected a Fellow of the Society in 1919, his application being sponsored by D. G. Hogarth and by Arthur Hinks, then Secretary of the Society. When he received the Founder's Medal in 1920, the President, Sir Francis Younghusband, referred to the care with which he had trained himself in geographical work and survey, and this set the tone for a long and fruitful association between Philby and the Society. He worked out and plotted his observations in collaboration with Mr. Harry F. Milne, senior draughtsman (now retired), and they prepared a series of maps which were published in the *Journal* and elsewhere. The first to appear showed the routes between Riyadh and Wādī ad Dawāsir, surveyed on Philby's 1918 journey in the southern Nejd (*Geogr. J.* 55 (1920) p. 240), and an earlier journey, from the Persian Gulf to the Red Sea in 1917, was mapped and published in Vol. 56 (1920) p. 510; these were the expeditions which earned him the Gold Medal. Mr. Milne, in a recent letter to the Society, recalls his association with Philby thus: "I much admired the mental energy he was able to concentrate on the plotting of his prismatic compass traverses for he worked all the day through at the R.G.S. without a break for lunch, until 4 o'clock when he had tea supplied by the housekeeper. I shall always regard it as a great privilege that I was associated with Mr. Philby in the construction of these maps, for they represent a remarkable contribution to the sum of human knowledge."

Material supplied by Philby was included in the Society's 'Map of Southern Arabia' (1958) and the Drawing Office has been working on his surveys, particularly of Najrān, up to the present time. Philby seldom visited the Society without bringing in some new observations, and the Society, in addition to eighteen folders of his work, holds the typescript copies of his diaries covering his journeys between 1946 and 1955. These documents, which he managed to smuggle out of Arabia by air just before his banishment, are characteristic of his wide range of human and intellectual interest and in them survey observations and transcriptions of Himyaritic inscriptions mingle with

records of the latest Test Match scores heard over his portable radio. During these long, and often solitary, desert journeys, Philby was able to free himself from the political and moral controversies into which he so hotly plunged in more civilized surroundings. All attention was concentrated, without thought of personal comfort or advantage, on the scrupulously careful collection of scientific observations of all kinds. These formed the foundations of our knowledge of Arabia. L.P.K.

JAMES BRABAZON GRIMSTON, FIFTH EARL OF VERULAM

The death of Lord Verulam on October 13 has deprived the country of a man who, having decided that something needed to be done, drove himself to the utmost until convinced that progress was being made. For his service to a cause he sought no recognition: satisfied that there should be a harvest irrespective of who did the reaping. He was fifty when he died.

At heart a Planner, he regarded geography as a science to be applied only as an equal partner in the triangle *man: place: work*. Few students of Le Play can have been faced, so early in their career, with the opportunity which came to him to put theory into practice. Arriving in South Wales from Christ Church in the mid-30's he found a community in which the normal processes of distribution had collapsed and which lacked the means to acquire even the bare necessities for life. Where many had looked and passed on Verulam stayed to help. His unorthodox but successful devices for dealing with the emergency are on record in the film 'Eastern Valley' which should surely be preserved as a page in the history of the Principality. The end of the depression was not the end of his work for Wales. In the magnificent factory which he built at Brynmawr men and women today work under conditions as nearly ideal as it is possible to make them.

Verulam was elected a Fellow of the Society in 1951 and in the same year presented "The geography of power," a Paper which he dramatically illustrated by conversing from the rostrum with an engineer on duty at a hydro-electric power station in Swedish Lapland. The Paper was carefully drafted to draw attention to what he felt was an unnecessary time lag between technical advance and the application of that advance in the service of mankind. He suggested that those responsible for planning transfers of electric power were often unaware of the tools which research had made available and that schemes involving more than one country were regarded as too complicated to be worthy of consideration. Much that he advocated, and in particular the cross-Channel power link, was accepted as practical in his lifetime.

Verulam travelled a great deal in the interest of his Companies and was an unselfish competitor in that his experience was readily at the disposal of British industry as a whole. It was appropriate that his final journey, to Australia as Chairman of the British Institute of Management, should have been undertaken on behalf of all. There must be very few countries in the world into which the knowledge that he will not pass that way again has not brought a sadness which is shared by his many friends at home and in the Society. In particular, he will be missed by the President and Council on which he served as a valued member from 1957 to 1960.

DR. F. G. M. STRATTON, D.S.O., O.B.E., T.D., F.R.S.

Dr. Stratton, formerly director of the Solar Physics Observatory, Cambridge, and Professor of Astrophysics in the University of Cambridge from 1928 to 1947, died in Cambridge on 2 September 1960, at the age of 79. He was a leading authority on the spectra of new stars and had travelled widely in connection with his astronomical studies. Apart from this he commanded a signal unit in the 1914–18 war, and saw much service in France where he was awarded the D.S.O. and Legion of Honour. During the 1939–45 war, he was again in uniform as a lieutenant-colonel and went on many missions to Canada, the U.S.A., Australia, New Zealand and India.

Stratton took a leading part in the organization of science both in this country and internationally. He was general secretary of the British Association from 1930–35;

general secretary of the International Council of Scientific Unions from 1937–52; and secretary of the Joint Permanent Eclipse Committee from 1923 onwards. He was president of Gonville and Caius College, from 1946–48, and at the time of his death senior fellow. He had been a member of the Expeditions Committee of the Society since 1956 serving as representative of The Royal Society. E. HINDLE

MISS CONSTANCE FRANCES MITCHELL

The death occurred on 29 August 1960 of Miss Constance Frances Mitchell, a Fellow of the Society since 1924. Miss Mitchell, who held an honours degree in history at London University and an academic diploma in geography, was senior geography mistress at Godolphin and Latymer School before becoming headmistress of East Ham Grammar School for Girls in 1943. From then onwards, she devoted herself wholeheartedly and with the greatest enthusiasm to the welfare of her school. In her busy life she found time to interest herself in the work of the Society, and was a member of the Education Committee from 1950 to 1958. Miss Mitchell will be remembered as much for her vital and vigorous personality as for her very real contribution to the Committee's activities.

DR. ALAN REECE

Alan Reece, a promising geologist, died on 28 May 1960 in a plane crash on Cornwallis Island, in the Canadian Arctic, at the early age of thirty-nine. Trained at Chelsea Polytechnic and Imperial College, London, he was from 1942 to 1944 meteorologist with the Royal Navy, then served with the Falkland Islands Dependencies Survey until 1948. In 1949 he joined the Norwegian–British–Swedish Antarctic expedition, and took part in the geological mapping of a largely unexplored area of some 10,000 square miles. During this work, a rock chip entered his eye, and the story of its removal by the expedition's young Swedish doctor, advised by radio from Stockholm, is both a remarkable Antarctic episode and a tribute to Reece's cheerful fortitude. After a year at Cambridge, Alan Reece joined the Uganda Geological Survey in 1953. But he felt the urge to return to polar scenes and after two more years at Imperial College, with summers in East Greenland, he joined the Geological Survey of Canada.

Alan Reece was an enterprising field-worker. Modest by nature, he was not a man to advertise his wares. Only those close to him, therefore, would easily have recognized his qualities of generosity and courage, his dedication to his work and his love for the freedom and challenge of polar exploration. L. P. KIRWAN

CORRESPONDENCE

'ARABIAN SANDS' BY WILFRED THESIGER

In Lord Belhaven's review of Thesiger's 'Arabian sands' in the *Geographical Journal*, March 1960, he says: "Then there is St.John Philby . . . Thesiger, in a part of one of his journeys, pays tribute to the astonishing accuracy of Philby's maps, since one of these, when there was no guide, led his small party over hundreds of miles of shifting sand and gravel to their goal, which was no more than a few tents and palms." And further on: "That was the first crossing; the second was to come, equally perilous and here Philby's map and a single well recorded by Thomas, took the place of guide. Thesiger trusted these charts made by his predecessors and rightly so. But the Arab is unversed in the science of cartography—they trusted Thesiger to guide them and their trust was well founded." Lord Belhaven then quotes from Thesiger himself: "On the eighth morning we climbed a final ridge. I had calculated that if we were ever to see Jabrin we should see it now; and there it lay, straight in front of us, the splashes of the palm groves dark on the khaki plain."

These few extracts describe an outstanding epic of successful desert navigation; death from thirst for the whole party would have been the penalty for failure. They had left Laylá to travel across 150 miles of uncharted sands on a single compass bearing on Jabrin (or Yabrīn). Thesiger himself says in 'Arabian sands,' p. 231: "I explained [to bin Ghabaisha] Abdullah Philby marked Jabrin on the map. I can find it by compass." And again on p. 233: "I knew that I should only have to be eight or ten miles out to miss Jabrin," and he asks himself: "Was Jabrin shown accurately on the map?"

The point I wish to raise is that Philby did not fix the latitude and longitude of Jabrin. I did, with a 3-inch theodolite and observations on sun and stars and a chronometer, and the computations were done by the R.G.S. staff under Mr. Reeves's competent supervision. Philby passed through Jabrin eight years after I had left and paid me the compliment of accepting my figures. I do not know whether he even checked for latitude (he had not the means of checking the longitude), and he used the figures as an advanced base for his journey across the sands. The maps in my 'In unknown Arabia' (1926) and Philby's 'The Empty Quarter' (1933) illustrate this.

It is hard that my surveys of Ḥasā and the Empty Quarter should be attributed, though inadvertently, to someone else, and Philby is a stickler for accuracy.

Cranbrook, Kent R. E. CHEESMAN
27 *June* 1960

In his review of Wilfred Thesiger's 'Arabian sands' Lord Belhaven quotes his "Tribute to the astonishing accuracy of Philby's maps," in connection with the successful quest for the oasis of Jabrin. While gratefully acknowledging the compliment, I would like to point out that both author and reviewer seem to have been unaware of the fact that the position of Jabrin was *first* established by R. E. Cheesman in 1924. My theodolite observations of 1932, calculated by the staff of the late Dr. L. J. Comrie of Greenwich Observatory, merely served to corroborate Cheesman's results, calculated by the late Mr. E. A. Reeves and the R.G.S. staff. We can therefore both take credit for the accuracy of our observations, but the credit of *priority* belongs to him.

The explanation of Thesiger's misunderstanding is doubtless that he only had with him the maps of Bertram Thomas and myself, both drawn by R.G.S. experts, during his travels. H. ST.J. B. PHILBY

*The Athenaeum, London, S.W.*1
8 *July* 1960

I am sorry that Colonel Cheesman feels that in my book I ignored the fact that he was the first European to visit and map the Jabrin oasis, especially as I owe my life to the accuracy of his mapping. He says in his letter: "Thesiger himself says ('Arabian sands,' p. 231) 'I explained [to bin Ghabaisha] Abdullah Philby marked Jabrin on the map. I can find it by compass.'" My reason in this case for mentioning Philby and not Cheesman to bin Ghabaisha was that bin Ghabaisha knew Philby but had never met Cheesman. However, on p. 100 I wrote: "Al Auf described Liwá to me as we sat there in the dark. It sounded very exciting, an oasis with palm groves and villages which extended for two days' camel journey. I knew no European had even been there and that it must be bigger than Jabrin, which Cheesman had discovered in 1924." Later in the book, on p. 233, I wrote when referring to the journey which lay ahead of me with a guide from Laylá to Jabrin: "Was Jabrin shown accurately on the map? Though Cheesman and Philby were meticulously accurate in their work, both of them had fixed Jabrin after a long journey. I could not recall what method they had used. If they had fixed the position by compass-traverse a ten-mile error was possible."

I do feel that in view of these two passages I have given Colonel Cheesman full credit for discovering Jabrin and for fixing its position on the map.

Royal Geographical Society, London WILFRED THESIGER
29 *September* 1960

INDEX

Capitals in main heading denotes articles and papers. Italics denotes books reviewed.
Short notes in single quotes

Aario, L. and Janus, H., *Biologische Geographie*, 99
Abyssinia, *see* Ethiopia
Accra Survey: I. Acquah, 521–3
Acquah, I., *Accra Survey*, 521–3
Addison, H., *Sun and shadow at Aswan*, 220–1
Adelaide Peninsula, 335 *et seq.*
Aden, Khat imports, 55 *et seq.*
Adie, R. J., awarded Mrs. Patrick Ness Award, 247, 385; remarks on "Hydrograph survey in British Antarctica," 316; at R. Inst. Chart. Surv., 562
Admiralty, "Authorship of the China Admiralty Handbook," 125
Adriatic, *Die Häfen der nördl. Adria und ihre Beziehungen zur österreich. Aussenwirtschaft*: J. Wartha, 517–18
Aerial photographic interpretation: D. R. Lueder, 550
Afghanistan, Cambridge Expedn., 113; *Géogr. de l'Afghanistan:* J. Humlum, 78; *The past present:* E. Hunter, 82
Africa—its peoples and their culture history: G. P. Murdoch, 351; *Agriculture and ecology in Africa:* J. Phillips, 520–1; *Atlas of Africa:* J. F. Horrabin, *rev. art.* by G. R. Crone, 70; *From Libyan sands to Chad:* N. Heseltine, 543; *Lugard in Africa:* A. A. Thomson and D. Middleton, 84; *No room in the ark:* A. Moorehead, 222; *Pagans and politicians:* M. Crowder, 84; *Seaports south of the Sahara:* R. G. Albion, 544; *The wild ass free:* M. Mason, 544
Africa, East, *Tribal maps of East Africa and Zanzibar:* J. E. Goldthorpe and F. B. Wilson, 365–6; *Yearbook and guide:* ed. A. G. Brown, 541
Africa, North, Note on new states, 379; atlas, *see* Middle East
Africa, Southern, *Yearbook and guide:* ed. A. G. Brown, 541
Africa, South-east, *L'image du sud-est africain dans la littérature européenne au XVIe siècle:* W. G. L. Randles, 84–5
Agostini, Father de, *Sfingi di ghiaccio*, 106
Agricultural Meteorology, Third Symposium, 254–5
Agriculture, *The challenge of the landscape: the development and practice of keyline:* P. A. Yeomans, 99–100
Aitken, R., letter on 'Spain: a geogr. background,' 126–7
Akester, R., leader, expedn. to Tibesti, 18
Alaska Expedn. 1956, Parachute Brigade, 490 *et seq.*; *Alaska in transition—the south-east region:* G. W. Rogers, 352; *Here is Alaska:* E. Stefansson, 109; *Moonlight at midday:* S. Carrighar, 230–1; *Mount McKinley, Alaska:* B. Washburn, 552
Alberta, Univ. of, Boreal Institute, 562
Albion, R. G., *Seaports south of the Sahara*, 544
Aled, 320 *et seq.*
Alexander, L. M., *World political patterns*, 101
Alexander, M., *Offbeat in Asia*, 545–6
Alps, *Across the Alps*, 362; *see also* Coolidge, W. A. B.; Swiss Found. Alp. Res.; Austria
Amazon, Lure of the: E. Barros Prado, 544
America, Latin, Short introdn. to economy of: F. Benham and H. A. Holley, 526
America, North, Evolution of: P. B. King, 109
America, South, Native peoples of: J. H. Steward and L. C. Faron, 225–6; *Red cloth and green forest:* A. Vinci, 88; *Die Westküste Südamerikas:* E. Schweigger, 354
Anderson, N., *The urban community*, 515–16
Andes, ORIGIN AND HIST. OF CENTRAL ANDEAN RELIEF: DIVERGENT VIEWS: Sir C. Cotton, 476–9; *see also* Apolobamba
Andrade, E. N. Da C., *Brief hist. of the Royal Society*, 506 *et seq.*
Andrew, E. D., 'Swash bars, Porthmissen beach, Trevone, N. Cornwall,' 560–1
Andrews, J. H., DEFOE AND THE SOURCES OF HIS 'TOUR', 268–77
Andrews, K. R., ed., *English privateering voyages to the West Indies* 1588–1595, 103
Angkor, Road to: C. Pym, 238
Annals of the Association of American Geographers, Map Supplement, 372
Anson, *Captain Anson and the treasure of Spain:* F. Knight, 107
Antarctica: F. Debenham, 530–1; A HYDROGRAPHIC UNIT IN BRITISH ANTARCTICA: C. J. C. Wynne-Edwards, 310–17; Antarctic Treaty 1959, 114; *America in the Antarctic to 1840:* P. Mitterling, 230; *Diary of R. W. Richards*, 107; *Endurance:* A. Lansing, 230; Fourth Soviet Antarctic Expedn., 254
Aozou, Tibesti, 20 *et seq.*
Apolobamba, Nudo de, EXPLORATION AND SURVEY ON BOLIVIA-PERU BORDER: W. H. Melbourne, 455–7; Imperial College Expedn., 113
Arabia, *Arabian sands:* Wilfrid Thesiger, *rev. art.* by Lord Belhaven, 73–4; letters by R. E. Cheesman, H. St.J. B. Philby and W. Thesiger, 567–8
Arabic geography, *see* Geography, Historical
Archaeology, Approach to: S. Piggot, 237; Industrial, conference, 254
Arctic world: J. Euller, 543; *The Arctic year:* P. Freuchen and F. Salomensen, 229–30; *Circumpolar Arctic flora:* N. Polunin, 229; *Northwest to fortune:* V. Stefansson, 531; *Pilot of Arctic Canada*, 228–9; *Siberian Arctic:* J. Lied, 355–6; STRING-BOGS IN ARCTIC 400 MILES NORTH OF TREE-LINE: W. E. S. Henoch, 335–9
Arequipa, 405 *et seq.*
Arizona, Pediments in southeastern: Yi-fu Tuan, 224–5
Arkell, A. J., remarks on "Geomorphology of Tibesti," 29–30
Armada, *see* Geography, Historical
Aschmann, H., *Central desert of Baja California*, 524–5
Ashbourne, MAP OF ASHBOURNE, DERBYSHIRE: E. M. Yates, 479–81
Asia, *Offbeat in Asia:* M. Alexander, 545–6; *Oriental despotism:* K. A. Wittfogel, 80; *Changing map of Asia:* W. G. East and O. H. K. Spate, 214; *Where China meets Russia:* J. E. Tashjean, 213
Asia, Central, *Britain and Chinese Central Asia:* A. Lamb, *rev. art.* by O. Lattimore, 504–6
Asia, South-west, *see Times Atlas of the World*
Aswan, *Sun and shadow at Aswan:* H. Addison, 220–1

Atlas of Classical World: A. A. M. van der Heyden and H. H. Scullard, *rev. art.* by G. R. Crone, 68–9; *Atlas of early Christian World:* F. van der Meer and C. Mohrmann, *rev. art.* by G. R. Crone, 68–9; *Historical atlas and gazetteer:* A. Toynbee and E. Myers, *rev. art.* by G. R. Crone, 68; *Oxford Economic Atlas of the World*, 2nd ed., *rev. art.* by G. R. Crone, 69; *see also* Cartography
Australia, *Australian accent:* J. D. Pringle, 90; *Australian hopes and fears:* C. Clark, 90; *Biogeography and ecology in:* ed. A. Keast and others, 226–7; *Opportunity in:* I. Douglas, 90; *A thousand and one Australians:* J. Heal, 544–5; *The tin scratchers:* I. L. Idriess, 546
Australia, South, Geology of: ed. M. F. Glaessner and L. W. Parkin, 89; *Introducing South Australia*, 90
Australia, Western, Stratigraphy of: J. R. H. McWhae *et al.*, 89
Australian Geographical Record, 120
Austria: C. Heller-Merricks, 541; *Bevölkerung und Wirtschaft in Südtirol:* A. Leidlmair, 209–10; Österreichischer Alpenverein, 363
Azores, Imperial College expedn., 113
Azucarani Glacier, 456–7

Bairacli Levy, J. de, *Summer in Galilee*, 364
Baker, J. N. L., 'The ends of the earth,' *rev. art.*, 70–3
Balchen, B., *Come north with me*, 107
Bangweulu, Lake, note on Livingstone's journey through, 376–7
Banks, M. E. B., *Rakaposhi*, 361–2; and Mills, E. J. E., ASCENT OF RAKAPOSHI, 1–11
Baraniecki, M., awarded Training College Prize for 1959, 111
Bardai, Tibesti, 20 *et seq.*
Barker, R., *The last blue mountain*, 362
Barnett, D., *The mask of Siam*, 109
Barrau Pelaez, M., H.E. The Bolivian Ambassador, remarks on "Exploration and survey on Bolivia-Peru border," 458
Barros Prado, E., *Lure of the Amazon*, 544
Barry, J. V., *Alexander Maconochie of Norfolk Island*, 105
Bartholomew, J., made C.B.E., 373; *see also Times Atlas of the World*
Basque Provinces, *Homenaje a D. Joaquin Mendizabal Gortazar*, 347; *see also* Spain
Batura Mustagh Expedn., 113
Beaches, *see* Coastal
Beagle, H.M.S., 129 *et seq.*
Beckingham, C. F., *Atlas of Arab world and Middle East*, 551
Beirut, *Géographie humaine de Beyrouth:* S. Chehabe-ed-dine, 519
Belgium, *Monografie der zeepolders:* L. de Leenheer and M. van Ruymbeke, 518; *Observns. on by-passed swallow-holes in Meuse and Lesse valleys:* G. T. Warwick, 517
Belhaven, Lord, 'Empty quarter no more,' *rev. art.*, 73–4
Bell, P. R., *Darwin's biological work: some aspects reconsidered*, 234
Benham, F., and Holley, H. A., *Short introdn. to economy of Latin America*, 526
Bentwich, N., *New-old land of Israel*, 519
Berry, L., *see* Tregear, T. R.
Bertram, C., *Adam's brood*, 99
Best, R. H., *Major land uses of Great Britain*, 343
Bibliographie Cartogr. Internat. 1957, 122
Bibliothèque Nationale, early maps, 246
Birdwood, Lord, remarks on "Geography, etc., of India's northern frontier," 309
Birket-Smith, K., *The Eskimos*, 230
Birot, P., *Morphologie structurale*, 96; *Précis de géographie physique générale*, 356–7
Bisch, J., *Jivaro, Geheimnisse des Amazonas*, 238
Bishop, M. S., *Subsurface mapping*, 531–2
Blanchard, R., *Mélanges géographiques canadiens offerts à Raoul Blanchard*, 352
Blažek, M., *Ökonomische Geogr. der tschechoslowak. Republik*, 76
Blomberg, R., *Buried gold and anacondas*, 88
Boal, F. W., *see* Proudfoot, V. B.
Bolin, B., ed., *The atmosphere and the sea in motion: Rossby Memorial Vol.*, 532–3
Bolivia, *see* Apolobamba
Bolton, A. R. C., *Soviet Middle East Studies*, 213–14
Borah, W., and Cook, S. F., *Population of Central Mexico in 1548*, 525
Borchert, J., *Changing geography of Minnesota*, 109
Boswell, P. C. H., quoted on the Elwy river system, 329–30
Bowen-Jones, H., *see* Fisher, W. B.
Bowman Memorial Lecture, *see* Gould, L. M.
Boxer, C. R., ed., *The tragic history of the sea, 1589–1622*, 358–9
Bramly, W. J., obit. by G. W. Murray, 258–9
Brasher, C., *see* Hunt, Sir J.
Brazil, CERRADO, CAATINGA AND PANTANAL: DISTRIBN. AND ORIGIN OF SAVANNA VEGETATION: M. M. Cole, 168–79; *Heart of the forest:* A. Cowell, 526–7
Brecknock, Geomorphology of: T. M. Thomas, 515
Briault, E. W. H., obit. of G. J. Cons, 123
British Assoc., activities 1956–60, 439; meeting, 1960, 555–6
British Guiana, *Run softly, Demerara:* Z. Freeth, 542
British Honduras, Land in: ed. D. H. Romney, 525–6
British Journal of Nutrition, see Kinloch, J. D.
British Museum, Map Room, 367–8; expedns., *see* Peru
British-Pakistani Forces Himalayan Expedition, *see* Rakaposhi
British Petroleum, *Adventure in oil:* H. Longhurst, 81
British-Polish Geographical Seminar, 115
Brockhaus, Der Grosse, 371
Brooke, C., KHAT (*Catha Edulis*): PRODUCTION AND TRADE IN MIDDLE EAST, 52–9
Brooke, R., British-Pakistani Forces Himalayan Expedition, 1 *et seq.*
Brown, A. G., ed., *Madeira and Canary Isles*, 541; *Yearbooks and guides to Southern and East Africa*, 541
Brown, R. Ll., remarks on "Hydrogr. survey unit in British Antarctica," 315–16
Bryan, R. *Gateway to the Khyber*, 82
Buchanan, Prof. R. O., remarks on "Agriculture and settlement in Peru," 409–10
Buchholzer, J., *Horn of Africa*, 85
Bulgaria, P.C.G.N. Lists of Names, No. 4, 244–5
Bunker, R., *see* Thorp, R. W.
Busch, N. F., *Thailand*, 545
Bushmen, *The harmless people:* E. M. Thomas, 85
Busoga, *see* Uganda
Butzer, K. W., *Die Naturlandschaft Ägyptens während der Vorgeschichte und der dynast. Zeit*, 219

Caatinga, *see* Brazil
Cailleux, A., *see* Soyer, R.
Caird, J. B., and others, *Park: geogr. study of a Lewis crofting district*, 211–12
Cairns, J., *Bush and boma*, 85
California, *Central desert of Baja California:* H. Aschmann, 524–5
Cambridge expedns, *see* Afghanistan, Colombia, Prokletije
Camb. Univ. Underwater Group, 562

Camden, W., *Britannia* and Defoe's 'Tour,' 273
Cameron, K., *Place-names of Derbyshire*, 344–5
Campbell, A., *The heart of India*, 81
Campbell, Miss E. M. J., remarks on "History in a map," 50
Canada, Atlas of, 241–2; *The Canadian North-west:* ed. F. H. Underhill, 223–4; *Journey to the Northern Ocean:* S. Hearne, ed. R. Glover, 87
Canada, Eastern, *Mélanges géogr. canadiens offerts à R. Blanchard*, 352
Canadian Arctic, *see* Arctic
Canary Isles, *see* Madeira
Canberra, Planning survey report of, 354–5
Caroe, Sir O., GEOGR. AND ETHNICS OF INDIA'S NORTHERN FRONTIERS, 298–309
Carpenter, E., and others, *Eskimo*, 107
Carrère, P., and Dugrand, R., *La région méditerranéenne*, 516–17
Carrighar, S., *Moonlight at midday*, 230–1
Carrington, R., *A guide to earth history*, 106
Carter, C. C., *Land-forms and life*, rev. M. O. Walter, 231–2
Cartography, *Aviation cartography* (bibliography) 2nd ed.: W. W. Ristow, 553; Bibliographie Cartographique Internat. 1957, 122; *Caxton world atlas:* ed. W. G. East, 359; Colloquium on vegetation maps, Centre Nat. de la Recherche Scient., 552; *Elements of:* A. H. Robinson, 548–50; *Der Grosse Brockhaus* (Atlas vol.): G. R. Crone, 371; *Histoire de la cartographie:* A. Libault, 93; MAP ROOM OF THE R.G.S.: G. R. Crone and E. E. T. Day, 12–17; Period maps, *see* Geography, Historical; TWO SOIL MAPS OF COUNTY DOWN: V. B. Proudfoot and F. W. Boal, 60–6; *The use of stereographic projection in structural geology:* F. C. Phillips, 356; *The world is round:* F. Debenham, 550–1; *see also Times Atlas of the World*
Casey, Lord, elected to R.G.S., 554; remarks at A.G.M., 383
Cassiterides, 165
Catha edulis, see Middle East
Caucasus, *The red snows:* Sir J. Hunt and C. Brasher, 518–19
Caxton world atlas: ed. W. G. East, 359
Central Asian Review, on boundary between Europe and Asia, 375–6
Centre National de la Recherche Scient., colloquium on vegetation maps, 552
Cerrado, *see* Brazil
Chadwick, Prof. O., *Mackenzie's grave*, 543
Chan-Chun, S., *Conquest of Minya Konka*, 105
Chapman, V. J., *Salt marshes and salt deserts of the world*, 534–5
Chapman, P. M., note on Indian tribes of Arinos-Juruena region, 250–2
Chardonnet, J., *Métropoles économiques*, 235
Cheesman, R. E., letter on "'Arabian sands" by Thesiger,' 567–8
Chehabe-ed-dine, S., *Géogr. humaine de Beyrouth*, 519
Cheshire, SOME PROBLEMS OF SUBSIDENCE AND LAND USE IN MID-CHESHIRE: K. L. Wallwork, 191–9
Chevrier, L., *St. Lawrence Seaway*, 86
China, *The junk man smiles:* C. R. G. Worcester, 363; *Simple geogr. of China:* Wang Chün-Heng, 78; and India's northern frontiers, 298 *et seq*; *see also* Asia, Lolas
Chinese mountaineering, *Ascent of Mustagh Ata:* Y. Ke-Hsien, 105; *Conquest of Minya Konka:* S. Chan-Chun, 105
Christodoulou, D., *Evolution of rural land use pattern in Cyprus*, 349–50
Chün-Heng, Wang, *Simple geogr. of China*, 78
Clapham, A. R., ed., *Field Studies, Vol. I, No. I*, 212
Clark, A. H., *Three centuries and the island*, 224
Clark, C., *Australian hopes and fears*, 90
Clark, R. W., *An eccentric in the Alps*, 362
Clayton, K. M., abstracts of geomorphology papers, 375
Cledwen, 318 *et seq.*
Clements, F., *Kariba*, 220
Clüver, P., on eastern boundary of Europe, 283–4
Clwyd, Vale of, 318 *et seq.*
Coastal changes: W. W. Williams, 533–4; *Beaches and coasts:* C. A. M. King, 231
Coimbra Univ., Centre of Geographical Studies, 120
Cole, M. M., CERRADO, CAATINGA AND PANTANAL: DISTRIBUTION AND ORIGIN OF SAVANNA VEGETATION OF BRAZIL, 168–79
Collins, K. St. B., remarks on "Hydrogr. unit in British Antarctica," 317
Colloques Internat. du Centre National de la Recherche Scient., 1958, *Topographie et la géologie des profondeurs océaniques*, 97
Colombia, Cambridge expedns., 112, 377–9
Colonizadora Noroeste Matogrossense, 250
Committee for Medical Geography, 110
Commonwealth Trans-Antarctic Expedition 1955–58, film-strip, 249
Condliffe, J. B., *New Zealand in the making*, 2nd ed., 91
Congo, Belgian, *see* Congo Republic
Congo Republic, *Le pays d'Uvira:* G. Weis, 221–2
Connell, Capt., remarks on "Hydrogr. unit in British Antarctica," 317
Cons, G. J., obit. by E. W. H. Briault, 123
Cook, S. F., *see* Borah, W.
Coolidge, W. A. B., *An eccentric in the Alps:* R. W. Clark, 362
Cordon Pio XI, 391 *et seq.*
Cornwall, IKTIN: Sir Gavin de Beer, 160–7; note on swash bars, Porthmissen Beach, Trevone, North Cornwall, by E. D. Andrew, 560–1
Corsica, *see* Mediterranean
Cortesão, A., awarded Victoria Medal, 247, 383; and Teixeira da Mota, A., *Portugaliae monumenta cartographica*, 547–8
Cott, H. B., *Uganda in black and white*, 544
Cotton, Sir C., ORIGIN AND HISTORY OF CENTRAL ANDEAN RELIEF: DIVERGENT VIEWS, 476–8
Council for British Archaeology, Conf. on Industrial Arch., 254
COUNTY DOWN, TWO SOIL MAPS OF: V. B. Proudfoot and F. W. Boal, 60–6
Cowell, A., *Heart of the forest*, 526–7
Crete, Durham Univ. expedn., 112
Crone, G. R., 'Atlases for several purposes,' *rev. art.*, 68–70; 'A German reference atlas,' 371; 'Revising the Michelin Map,' 370–1; and Day, E. E. T., THE MAP ROOM OF THE R.G.S., 12–17; *see also* Edwards, K. C.
Crossley, J. C., remarks on "Agriculture and settlement in Peru," 411
Crowder, M., *Pagans and politicians*, 84
Cumberland, K. B., and Fox, J. W., *New Zealand, regional view*, 91
Cyprus, *Annals Association of American Geographers, Map Supplement:* N. J. W. Thrower, *Note* by W. G. East, 372; *Evolution of rural land use pattern in Cyprus:* D. Christodoulou, 349–50
Czechoslovakia, *Ökonomische Geographie der tschechoslowakischen Republik:* M. Blažek, 78; P.C.G.N. Lists of Names, No. 3, 244–5

Darby, H. C., AN HISTORICAL GEOGRAPHY OF ENGLAND: TWENTY YEARS AFTER, 147–59
DARWIN AS A TRAVELLER: Sir C. Darwin, 129–36; *Darwin's biological work: some aspects reconsidered:* ed. P. R. Bell, 234; Darwin Centenary, commemoration by U.S.S.R., 374

Darwin, Sir C., DARWIN AS A TRAVELLER, 129–36
Davis, J. K., obit. of F. P. Evans, 123
Day, E. E. T., *see* Crone, G. R.
Deacock, A., *No purdah in Padam*, 364
Deacon, G. E. R., on the Antarctic Ocean, 255–6
Debasser, Tibesti, 23
De Beer, Sir Gavin, IKTIN, 160–7; remarks on "Darwin as a traveller," 136–9
Debenham, F., *Antarctica: the story of a continent*, 530–1; *The World is round*, 550–1
Deffontaines, P., ed., and Delamarre, J.-B., *Géographie Universelle Larousse*, Vol. 1, 75; Vols. 2 and 3, 537–8
DEFOE AND THE SOURCES OF HIS 'TOUR': J. H. Andrews, 268–77
Delamarre, J.-B., *see* Deffontaines, P.
Delprat, G. D., *A vision of steel:* P. Mawson, 227
Denbighshire, THE ELWY RIVER SYSTEM, DENBIGHSHIRE: C. Embleton, 318–34
Derbyshire, Place-names of, K. Cameron, 344–5
Derfyn, 323 *et seq.*
Deunant, 325 *et seq.*
Deutscher Geographentag Würzburg, 1957, *Tagungsbericht und wissenschaftliche Abhandlungen*, 538–9
Dicks, D. R., *The geographical fragments of Hipparchus*, 535
Djibouti, French Somaliland, Khat consumption, 53, 57–8
Dobbie, J. F., *Lost mines of the old west*, 542
Doha, 444
Dolomites, *see* Italy
Don, note on, 380
Dore, R. P., *Land reform in Japan*, 79
Doresse, J., *Ethiopia*, 523
Douglas, I., *Opportunity in Australia*, 90
Dresch, J., on Andean relief, 476 *et seq.*
Dugdale, W., *Monasticon Anglicanum* and Defoe's 'Tour,' 273–4
Dugrand, R., *see* Carrère, P.
Dukhan, 444–5
Durham Univ. expedns., *see* Crete

East, Prof. W. G., remarks on "History in a map," 49 *et seq.*; *The Caxton world atlas*, 359; 'Map Supplement to the Annals of American Geographers,' 372; and Spate, O. H. K., *Changing map of Asia*, 3rd ed., 214
Ecuador, *Buried gold and anacondas:* R. Blomberg, 88; *Shadow of the Almighty:* E. Elliott, 108
Education, *see* Geographical education
Edwards, K. C., and Crone, G. R., GEOGRAPHY IN GREAT BRITAIN 1956–60, 427–41
Egypt, *Egyptian art:* B. de Rachewiltz, 523; *Die naturlandschaft Ägyptens während der Vorgeschichte und der dynastischen Zeit:* K. W. Butzer, 219
Elliott, E., *Shadow of the Almighty*, 108
Elwin, V., *A philosophy for N.E.F.A.*, 216
Elwy, *see* Denbighshire
Embleton, C., THE ELWY RIVER SYSTEM, DENBIGHSHIRE, 318–34
Emmanuel, M., *France et l'exploration polaire*, 529–30
Emslie Horniman Anthropological Studentships, 122
England, AN HISTORICAL GEOGRAPHY OF ENGLAND: TWENTY YEARS AFTER: H. C. Darby, 147–159; *Local history in England:* W. G. Hoskins, 345
England, North: A. E. Smailes, 344; *see also* Tees-side
England and Wales, land use survey, 121, 558–9; *Agriculture and urban growth:* G. P. Wibberley, 343–4
English Channel, The: J. A. Williamson, 208–9; *The narrow seas:* R. Hargreaves, 208–9
Ergs, 200 *et seq.*
Eskimos, The: K. Birket-Smith, 230; *Eskimo:* E. Carpenter and others, 107
Ethiopia: J. Doresse, 523; *Kulturgeographie der südäthiopischen Seenregion:* W. Kuls, 82; *The Ethiopians:* E. Ullendorff, 351; Khat production and export, 52 *et seq.*
Euller, J., *Arctic world*, 543
Eurasia, note on boundary between Europe and Asia, 375–6
EUROPE: HOW FAR? W. H. Parker, 278–97; *Land consolidation in Europe*, 514–15; *Wake up in Europe:* C. Simpson, 546
Europe, Central, *Atlas östliches Mitteleuropa:* Th. Kraus and others, *rev. art.* by G. R. Crone, 69; *Landformen im mittleren Europa: morphograph. Karte mit Reliefenergie*, 1:2M: H. Waldbaur, 240–1
Europe, Eastern, *Resources and planning in Eastern Europe:* ed. N. J. G. Pounds and N. Spulber, 76
Europe, Western, *A regional geography of Western Europe:* F. J. Monkhouse, 345–6
Evans, F. P., obit. by J. K. Davis, 123
Everest, Mount, 362
Exploration Review, 256

Fairley, T. C., *Sverdrup's Arctic adventures*, 540
Farmer, B. H., remarks on "Agriculture and settlement in Peru," 410
Faron, L. C., *see* Steward, J. H.
Fenton, *The troublesome voyage of Captain Edward Fenton, 1582–1583*: ed. E. G. R. Taylor, 236
Field Survey Association, prize, 380
Finberg, H. P. R., remarks on "History in a map," 49–50
Firth, R., *Economics of the New Zealand Maori*, 528–9; *Social change in Tikopia*, 528–9
Fisher, W. B., and Bowen-Jones, H., letter on 'Spain: a geographical background,' 125–6
Fitzroy, R., commander of the *Beagle*, 129 *et seq.*
Fleming, C. A., ed. and tr., *see* Hochstetter, F. von
Fochler-Hauke, G. von, *Allgemeine Geographie*, 206–7
Foncin, M., 'Vegetation maps,' 552
Foreman, J. B., ed., *Scotland's splendour*, 541
Fowler, W., *This island's mine*, 228
Fox, J. W., *see* Cumberland, K. B.
France, *Atlas de la France de l'est, rev. art.* by G. R. Crone, 70; *Exposé des travaux de l'Institut Géographique National*, 368–9; *Géologie de la région parisienne:* R. Soyer and A. Cailleux, 238; *Railways of France*; 238; *La région du nord et du nord-est:* R. Nistri and C. Prêcheur, 209; *La région lyonnaise:* J. Labasse and M. Laferrère, 516–17; *La région méditerranéenne:* P. Carrère and R. Dugrand, 516–17; *La région parisienne:* P. George and P. Randet, 209; *South from Toulouse:* A. Shirley, 541–2; *Niveaux optima des villes:* A. Vakili and others, 348–9
Franklin, Sir John, *Quest for Franklin:* N. Wright, 92; letter from Lady Franklin, 339
Freeman, J. D., ed., and W. R. Geddes, *Anthropology in the South Seas*, 529
Freeman, O. W., and Raup, H. F., *Essentials of geogr.*, 359–60
Freeman, T. W., *Conurbations of Great Britain*, 207; letter on 'The authorship of the China Admiralty Handbook,' 125
Freeth, Z., *Run softly, Demerara*, 542
Freuchen, P., and Salomensen, F., *The Arctic year*, 229–30
Fullerton, B., *see* House, J. W.
Fürer-Haimendorf, C. von, obit. of J. P. Mills, 380–1

Gadjah Mada University, 112
Garner, H. F., on Andean relief, 476 *et seq.*
Garrison, W. L., and others, *Studies of highway development and geographic change*, 234–5
Geddes, W. R., *see* Freeman, J. D.
Gellert, J. F., *Grundzüge der physisch. Geogr. von Deutschland*, I, 76
Gende Alisho, Ethiopia, 53
Geograph. Assoc., activities 1956–60, 440
Geographical education, CAREERS FOR GEOGRAPHERS, 451–4; *Field Studies, Vol. I, No. 1:* ed. A. R. Clapham, 212; *Peoples of other lands:* G. E. D. Lewis, 216–17
GEOGRAPHY IN GREAT BRITAIN 1956–60: K. C. Edwards and G. R. Crone, 427–41; *Allgemeine Geographie:* G. Fochler-Hauke, 206–7; *Applied geography:* L. D. Stamp, 360; *Essentials of geography*, 2nd ed.: O. W. Freeman and H. F. Raup, 359–60; *Geographical essays in memory of A. G. Ogilvie:* ed. R. Miller and J. W. Watson, 537; *Géographie Universelle Larousse*, I: ed. P. Deffontaines and J.-B. Delamarre, 75; *Geogr. Forschungen, Festschrift zum 60. Geburtstag von Hans Kinzl:* ed. H. Paschinger, 232; GEORGE PERKINS MARSH ON THE NATURE AND PURPOSE OF GEOGRAPHY: D. Lowenthal, 413–17; *Perspective on the nature of geography:* R. Hartshorne, *rev. art.* by A. F. Martin, 205–6; *Tagungsbericht und wissenschaftliche Abhandlungen*, Deutscher Geographentag Würzburg, 1957, 538–9
Geography, Biological, *Biologische Geographie:* L. Aario and H. Janus, 99; *Adam's brood:* C. Bertram, 99
Geography, Economic, *Geography of iron and steel:* N. J. Pounds, 235–6; *Towards a geography of price:* W. Warntz, 100
Geography, Historical, *Defeat of the Spanish Armada:* G. Mattingly, 357–8; *The Elizabethans and America:* A. L. Rowse, 357–8; HISTORY IN A MAP: E. M. Yates, 32–51; *Introductory chapters of Yāqūt's Mu'jam al-Buldān:* tr. Wadii Jwaideh, 104; *The tragic history of the sea 1589–1622:* ed. C. R. Boxer, 358–9
Geography, Human, *A geography of man:* P. E. James, 102; *An introduction to human geography*, 2nd ed.: J. H. G. Lebon, 102
Geography, Physical, *The atmosphere and the sea in motion: The Rossby Memorial Volume:* ed. B. Bolin, 532–3; *Land-forms and life:* C. C. Carter, rev. M. O. Walter, 231–2; *Mers, glaciers, volcans:* E. Scaioni, 98; *Physische-geogr. Stud., Festschrift zur Vollendung des 60. Lebensjahres von Hans Spreitzer:* ed. K. Wiche, 232–3; *Précis de géographie physique générale:* P. Birot, 356–7
Geography, Political, *Military aspects of world political geography*, 236–7; *World political patterns:* L. M. Alexander, 101
Geography, Urban, *Métropoles économiques:* J. Chardonnet, 235; *Readings in urban geography:* H. M. Mayer and C. F. Kohn, 361; *Studies of highway development and geogr. change:* W. L. Garrison and others, 234–5
Geology, *Earth's shifting crust:* C. H. Hapgood, 94; *A revised geological time-scale:* A. Holmes, *rev. art.* by O. T. Jones, 511–14; *Subsurface mapping:* M. S. Bishop, 531–2; *Use of stereographic projection in structural geology:* F. C. Phillips, 356
Geomorphology, *Handbuch der Geomorph.*, 2nd ed.: O. Maull, 96; *Morphologie structurale:* P. Birot, 96; abstracts of geomorphology papers, 375
Geophysics, *Earth's shifting crust:* C. H. Hapgood, 94; *Guide to earth history:* R. Carrington, 106
George, P., and Randet, P., *La région parisienne*, 209
Germany, *Die chemische Industrie Deutschlands:* H. Schall, 211; *Grundzüge der physischen Geogr. von Deutschland*, I: J. F. Gellert, 76; *Hydrogeologische Übersichtskarte*, 553; *Die Karten deutscher Länder im Brüsseler Atlas des Christian s'Grooten* (1573): ed. H. Mortensen and A. Lang, 239–40; *Physische Geogr. Deutschlands:* F. Haefke, 210–11; 'Official and private cartography in Germany,' by E. Meynen, 369–70
Germany, Western, *Entwicklungsperioden agrarer Siedlungsgebiete im mittleren Westdeutschland seit dem frühen 13. Jahrhundert:* H. Jäger, 77; Hydrogeological map, Fed. Repub. Germany, E. Meynen, 553
Glaessner, M. F., ed., and Parkin, L. W., *Geology of South Australia*, 89
Glasgow Univ. Survey, *see* Visdal
Globes, in R.G.S. collection, 16
Glover, R., ed., *see* Hearne, S.
Goldthorpe, J. E., and Wilson, F. B., *Tribal maps of East Africa and Zanzibar*, 365–6
Gor'kiy, 182 *et seq.*
Gorngletscher Glaciological Survey, 1959–60, 112
Gorodets, 185
Gottmann, J., *Études sur l'état d'Israël et le Moyen Orient*, 214–15
Gould, L. M., *The polar regions in their relation to human affairs* (Bowman Memorial lecture), 92
Goullart, P., *Princes of the black bone*, 219
Gourou, P., *The tropical world*, tr. E. D. Laborde, 234
Grace Brothers, sugar estate at Paramonga, 397 *et seq.*
Graham Land, 310 *et seq.*
Great Britain, Conurbations of: T. W. Freeman, 207; DEFOE AND THE SOURCES OF HIS 'TOUR': J. H. Andrews, 268–77; GEOGR. IN GREAT BRITAIN 1956–60: K. C. Edwards and G. R. Crone, 427–41; *Major land uses of Great Britain:* R. H. Best, 343
Greaves, R. L., *Persia and the defence of India*, 80
Grenfell, Wilfred: J. L. Kerr, 540–1
s'Grooten, C., *Die Karten deutscher Länder im Brüsseler Atlas des Christian s'Grooten* (1573): ed. H. Mortensen and A. Lang, 239–40
Grove, A. T., awarded Back Grant, 247, 385; GEOMORPHOLOGY OF THE TIBESTI REGION WITH SPECIAL REFERENCE TO WESTERN TIBESTI, 18–31; note on "Sand formations in the Niger Valley," 202–3
Guatemala, *Sons of the shaking earth:* E. R. Wolf, 353
Gulf Stream: H. Stommel, 98

Haefke, F., *Physische Geogr. Deutschlands*, 210–11
Haggett, P., remarks on "Agriculture and settlement in Peru," 411
Hal al-Shemal tribes, 444–5
Hannum, A., *Paint the wind*, 108
Hansen, H. H., *Daughters of Allah*, 542–3
Hapgood, C. H., *Earth's shifting crust*, 94
Haramosh, *The last blue mountain:* R. Barker, 362
Harar, Ethiopia, 53 *et seq.*
Hargreaves, R., *The narrow seas*, 208–9
Harley, R., and Defoe, 270
Hartley, Sir H., ed., *The Royal Society*, 506 *et seq.*
Hartshorne, R., *Perspective on the nature of geography*, 205–6
Hawke's Bay, The story of: A. H. Reed, 355
Hay, Sir R., *The Persian Gulf States*, 217
Heal, J., *A thousand and one Australians*, 544–5
Hearne, S., *Journey to the Northern Ocean*, ed. R. Glover, 87
Heller-Merricks, C., *Austria*, 541
Henoch, W. E. S., STRING-BOGS IN THE ARCTIC 400 MILES NORTH OF THE TREE-LINE, 335–9

Heseltine, N., *From Libyan sands to Chad*, 543
Heyden, A. A. M. van der, and Scullard, H. H., *Atlas of the Classical World*, 68–9
Hillary, Sir E., Thomas Cawthorn Lecture, 256
Hills, E. S., *Physiography of Victoria*, 527
Hills, T. L., *St. Lawrence Seaway*, 86
Himalayan Exped. 1958, British-Pakistani Forces, *see* Rakaposhi; *Chronique himalayenne:* M. Kurz, 363; *Himalayan venture:* F. Kolb, 106; and India's northern frontiers, 299 *et seq.*; *No purdah in Padam:* A. Deacock, 364
Hindle, E., obit. of F. G. M. Stratton, 566; remarks on "The ascent of Rakaposhi," 10–11
Hipparchus, The geographical fragments of: ed. D. R. Dicks, 535
Hochstetter, F. von, *Geology of New Zealand*, ed. and tr. C. A. Fleming, 227–8
Hodder, B. W., *Man in Malaya*, 351
Holdsworth, M., *Turkestan in the nineteenth century*, 217
Holford, 197
Holley, H. A., *see* Benham, F.
Holmes, A., *A revised geological time-scale*, 511–14
Hong-Kong, *The development of Hong-Kong as told in maps:* T. R. Tregear and L. Berry, 350
Hooson, D. J. M., THE MIDDLE VOLGA—AN EMERGING FOCAL REGION IN THE SOVIET UNION, 180–90
Hope, S., *Give me the sea*, 108
Horrabin, J. F., *An atlas of Africa*, 70
Hoskins, W. G., *Local history in England*, 345
House, J. W., and Fullerton, B., *Tees-side at mid-century*, 515
Hubbs, C. L., *Zoogeography*, 233
Huddart, M., awarded Training College Prize 1959, 111
Hueck, K., *Wandlungen im Antlitz der Landschaft um São Paulo (Brasilien)*, 353–4
Humlum, J., *La géographie de l'Afghanistan*, 78
Hunt, Sir J., and Brasher, C., *The red snows*, 518–19
Hunter, E., *The past present*, 82
Hunting, P. L., made Knight Bachelor, 373
Huxley, E., *The flame trees of Thika*, 106

Ica Valley, 400 *et seq.*
Iceland, Imperial College Explorn. Board's Expedn., 113
Idriess, I. L., *The tin scratchers*, 546
IKTIN: Sir Gavin de Beer, 160–7
Ilešič, S., *Die Flurformen Sloweniens*, 212–13
Imperial College expedns., *see* Apolobamba, Azores, Iceland
Incas, *see* Peru
India, *Bombay Geographical Magazine: Land Use Special*, 350–1; THE GEOGRAPHY AND ETHNICS OF INDIA'S NORTHERN FRONTIERS: Sir O. Caroe, 298–309; *The heart of India:* A. Campbell, 81; *Historical records of Survey of India, Vol. IV, 1830–1843:* R. H. Philimore, 215–16; *Indian jute belt:* P. Sengupta, 350; KULU-LAHUL-SPITI WATERSHED: J. P. O'F. Lynam, 481–2; *Persia and the defence of India:* R. L. Greaves, 80; *A philosophy for N.E.F.A.:* V. Elwin, 216; *see also* Nepal
Innes, H., *Harvest of journeys*, 544
Institut Géographique National, Exposé des travaux de, 368–9
Institute of British Geographers, activities 1956–1960, 439–40; annual conference, 249
International Cartographic Association, 242–3
International Congress for the History of Discoveries, Lisbon, 1960, 557–8
Internat. Geogr. Congr. Stockholm, 557
Internat. Geogr. Union Regional Conference in Japan, 1957, Proceedings of the, 360–1
Internat. Hydrographic Bureau, Monaco, *General bathymetric chart of the oceans: Sheet A.1*, 533
Internat. Symposium, karst problems, 252–3
Iraq, INVESTIGATIONS INTO SOILS AND AGRICULTURE OF MIDDLE DIYĀLÁ REGION, EASTERN IRAQ: C. W. Mitchell and P. E. Naylor, 469–475
Iron industry, *see* Geography, Economic
Israel, *Études sur l'état d'Israel et le Moyen Orient:* J. Gottmann, 214–15; *The new-old land of Israël:* N. Bentwich, 519; *Summer in Galilee:* J. de Bairacli Levy, 364
Italy, *Alleghe area, Italian Dolomites*, 211–12

Jäger, H., *Entwicklungsperioden agrager Siedlungsgebiete im mittleren Westdeutschland seit dem frühen 13. Jahrhundert*, 77
Jahrbuch des österreich Alpenvereins, 363
James, P. E., *A geography of man*, 102
Janus, H., *see* Aario, L.
'Japan since 1945,' Library Association Special Subject List No. 31, 122; *Land reform in Japan:* R. P. Dore, 79; *Meeting with Japan:* F. Maraini, 364; *Proceedings of the International Geographical Union Regional Conference in Japan, 1957*, 360–1; visit of M. J. Wise, 117
Java, *Social status and power in Java:* L. H. Palmier, 520
Jervis, Prof. W. W., obit. by R. F. Peel, 257–8
Jobson, A., *An hour-glass on the run*, 108
John Biscoe, R.R.S., 312 *et seq.*
Johnson, *Indian killer:* R. W. Thorp and R. Bunker, 87
Johnstone, T. M., and Wilkinson, J. C., SOME GEOGRAPHICAL ASPECTS OF QAṬAR, 442–50
Jones, O. T., 'Geological time scales,' *rev. art.*, 511–14
Jwaideh, Wadii, tr., *Introductory chapters of Yāqūt's Mu'jam al-Buldān*, 104

Kandabwe, 144
Kara Sea route, *Siberian Arctic:* J. Lied, 355
Kariba: F. Clements, 220; PROGRESS AND GEOGR. SIGNIFICANCE OF KARIBA DAM: W. H. Reeve, 140–6
Kashmir and India's frontiers, 301 *et seq.*
Kazan', 180 *et seq.*
Keast, A., and others, *Biogeography and ecology in Australia*, 226–7
Kenya, *The flame trees of Thika:* E. Huxley, 106
Kerr, J. L., *Wilfred Grenfell*, 540–1
Keyline, *see* Agriculture
Khartoum, Univ. of, report on water hyacinth, 562
Khat, *see* Middle East
Khyber, Gateway to the: Robin Bryan, 82
King, C. A. M., *Beaches and coasts*, 231
King, P. B., *Evolution of North America*, 109
King William Id., 335 *et seq.*
Kingledoors valley, 483 *et seq.*
Kinloch, J. D., and Mills, E. J. E., PROVISIONING OF MOUNTAINEERING EXPEDITIONS, 490–8
Kinross, Lord, *Turkey*, notes by R. Mantram, 364
Kinzl, H., *see* Paschinger, H., ed.
Kirwan, L. P., obit. of Sir L. Woolley, 256–7; *The white road*, 70; obit. of Dr. A. Reece, 567
Knight, F., *Captain Anson and the treasure of Spain*, 107
Kohn, C. F., *see* Mayer, H. M.
Kolb, F., *Himalayan venture*, 106
Kraus, Th., and others, *Atlas östliches Mitteleuropa*, 69
Kuls, W., *Kulturgeographie der südäthiopischen Seenregion*, 82
Kulu, *see* India
Kuper, H., *Indian people in Natal*, 521
Kurdistan, *Daughters of Allah:* H. H. Hansen, 542–3; Turkish, *Riding to the Tigris:* F. Stark, 218
Kurz, M., *Chronique himalayenne*, 363
Kuybyshev, 180 *et seq.*

Labasse, J., and Laferrère, M., *La région lyonnaise*, 516–17
Laborde, E. D., tr., *see* Gourou, P.
Laferrère, M., *Lyon, ville industrielle*, 515–16; *see also* Labasse, J.
Lahul, *see* India
Lamb, A., *Britain and Chinese Central Asia*, 504–6
Lambert, J. M., awarded Gill Memorial, 247, 385; and others, *The making of the Broads*, 341–342
Land's End, 161 *et seq.*
Lang, A., ed., *see* s'Grooten, C.
Lansing, A., *'Endurance,'* 230
La Paz, 455
Larimore, A. E., *The alien town: patterns of settlement in Busoga, Uganda*, 521
Larousse, Géographie Universelle, Vol. 1: ed. P. Deffontaines and J.-B. Delamarre, 75; Vols. 2 and 3, 537–8.
Lasserre, G., *Libreville: la ville et sa région*, 521–3
Lattimore, O., 'Frontier dilemmas in Central Asia,' *rev. art.*, 504–6
Lautaro, 391 *et seq.*
Law, P., awarded Founder's Medal, 247, 383
Layton, T. A., *Wines and castles in Spain*, 238
Lebon, J. H. G., *Introd. to human geography*, 2nd ed., 102
Leenheer, L. de, and Ruymbeke, M. van, *Monografie der zeepolders*, 518
Leicester Univ. expedns., *see* Norway
Leidlmair, A., *Bevölkerung und Wirtschaft in Südtirol*, 209–10
Leszczycki, S., APPLICATION OF GEOGRAPHY IN POLAND, 418–26
Levy, *see* Bairacli Levy, J. de
Lewis, *Park: geogr. study of Lewis crofting district:* J. B. Caird and others, 211–12
Lewis, G. E. D., *Peoples of other lands*, 216–17
Lewis, W. V., ed., *Norwegian cirque glaciers*, 500–3; remarks on "Agriculture and settlement in Peru," 411
Libault, A., *Histoire de la cartographie*, 93
Library of Congress, Map Division, 244
Libreville: la ville et sa région: G. Lasserre, 521–3
Lied, J., *Siberian Arctic*, 355–6
Lighthouses, *World's lighthouses before 1820*: A. Stevenson, 545
Linstead, Sir P., remarks on "Exploration . . . on Bolivia-Peru border," 458
Liverpool Univ., course on "Recent developments in geogr." 122
Livingstone, David: family letters: ed. I. Schapera, 222–3; note on journey through Lake Bangweulu, 376–7
Llanganati, *Buried gold and anacondas:* R. Blomberg, 88
Lolas, *Princes of the black bone:* P. Goullart, 219
Longhurst, H., *Adventure in oil, the story of British Petroleum*, 81
Lowenthal, D., G. P. MARSH ON NATURE AND PURPOSE OF GEOGRAPHY, 413–17; *George Perkins Marsh*, 539–40
Lueder, D. R., *Aerial photographic interpretation*, 550
Lugard in Africa: A. A. Thomson and D. Middleton, 84
Lynam, J. P. O'F., KULU-LAHUL-SPITI WATERSHED, 481–2
Lyon, ville industrielle: M. Laferrère, 515–16

Mackenzie's grave: Prof. O. Chadwick, 543
Maclean, F., *Back to Bokhara*, 218
McClymont, W. G., *Exploration of New Zealand*, 2nd ed., 90
McConachy, S., on soil maps, 60 *et seq.*
Macky, J., his 'Journey' and Defoe's 'Tour,' 273–4
McLintock, A. H., *Descriptive atlas of New Zealand*, 366
McMahon Line, 305 *et seq.*
Maconochie, A., *Alexander Maconochie of Norfolk Island:* J. V. Barry, 105; CAPT. MACONOCHIE, R.N., K.H., 1787–1860: R. G. Ward, 459–68
McWhae, J. R. H., and others, *Stratigraphy of Western Australia*, 89
Madeira and Canary Isles: A. G. Brown, 541
Maitland, L., *Forest venture*, 545
Makiritari, *Red cloth and green forest:* A. Vinci, 88
Malaya, *Man in Malaya:* B. W. Hodder, 351
Maling, P. B., ed., *see* Torlesse, C. O.
Manchester Geogr. Soc., 75th anniversary, 114
Mantram, R., *see* Kinross, Lord
Manwaring, G. E., *Woodes Rogers, privateer and governor*, ed. A. Deans Peggs, 104
Maraini, F., *Meeting with Japan*, tr. E. Mosbacher, 364
Marazion, 162 *et seq.*
Marseilles, early trade, 161 *et seq.*
Marsh, George Perkins: D. Lowenthal, 539–40; G. P. MARSH ON NATURE AND PURPOSE OF GEOGRAPHY: D. Lowenthal, 413–17
Marshall-Cornwall, Sir J., remarks on "Geography, etc., of India's northern frontier," 309
Marston, 193 *et seq.*
Martin, A. F., 'Second thoughts on nature of geogr.,' *rev. art.*, 205–6
Mason, M., *The wild ass free*, 544
Mato Grosso, note on the Indian tribes of Arinos-Juruena region by P. M. Chapman, 250–2
Mattingly, G., *Defeat of the Spanish Armada*, 357–8
Maull, O., *Handbuch der Geomorphologie*, 2nd ed., 96
Mauro, Fra, 'Mappamundi,' representn. of Russia, 281
Mawson, P., *A vision of steel: life of G. D. Delprat*, 227
Mayer, H. M., and Kohn, C. F., *Readings in urban geography*, 361
Meckelein, W., *Forschgn in der zentralen Sahara: I. Klimageomorphologie*, 220
Mediterranean, *Sicily, Sardinia and Corsica:* E. and B. Whelpton, 542; *La topographie et la géologie des profondeurs océaniques*, 97
Meer, F. van der, and Mohrmann, Christine, *Atlas of early Christian World*, 68–9
Melbourne, W. H., EXPLORATION AND SURVEY ON THE BOLIVIA-PERU BORDER, 455–7
Mendizabal Gortazar, Homenaje a D. Joaquin, 347
Meteorology, *Weathercraft:* L. P. Smith, 534
Mexico, *Population of Central Mexico in 1548*: W. Borah and S. F. Cook, 525; *Sons of the shaking earth:* E. R. Wolf, 353
Meynen, E., 'German cartography,' note on, 369–70; Hydrogeological map, Fed. Repub. Germany, 553
Michelin, 'Revising the Michelin Map,' by G. R. Crone, 370–1
Middle East and North Africa, The,—Oxford regional economic atlas, 551; *Atlas of the Arab world and the Middle East:* C. F. Beckingham, 551; *Forest venture:* L. Maitland, 545; KHAT (CATHA EDULIS): PRODUCTION AND TRADE IN MIDDLE EAST: Clarke Brooke, 52–9; *Soviet Middle East Studies, Parts I–VIII:* A. R. C. Bolton, 213–14; *see also* Israel
Middlewich, 191 *et seq.*
Military geography, *see* Geography, Political
Miller, R., and Watson, J. W., eds., *Geogr. essays in memory of A. G. Ogilvie*, 537
Mills, E. J. E., *see* Banks, M. E. B., Kinloch, J. D.
Mills, J. P., obit. by C. von Fürer-Haimendorf, 380–1
Minnesota, Changing geography of: J. Borchert, 109

Minya Konka, The ascent of: S. Chan-Chun, 105
Mitchell, C. F., obit., 567
Mitchell, C. W., and Naylor, P. E., INVESTIGATIONS INTO SOILS AND AGRICULTURE OF MIDDLE DIYĀLÁ REGION, EASTERN IRAQ, 469–75
Mitterling, P., *America in the Antarctic to 1840*, 230
Moffett, J. P., ed., *Handbook of Tanganyika*, 2nd ed., 83
Mohrmann, Christine, *see* Meer, F. van der
Monkhouse, F. J., *A regional geogr. of Western Europe*, 345–6
Monod, Prof. Th., awarded Patron's Medal, 247, 382–3; quoted by A. T. Grove, 202–3
Montgomery, Field-Marshall Viscount, principal guest at Annual Dinner, 386
Moore, Mrs. H. A., gift of ship's bell engraved "Nimrod. Riga," 247
Moorehead, A., *No room in the ark*, 222
Mortensen, H., *see* s'Grooten, C.
Mosbacher, E., tr., *see* Maraini, F.
Mountaineering, PROVISIONING OF MOUNTAINEERING EXPEDITIONS: J. D. Kinloch and E. J. E. Mills, 490–8
Mountbatten, Lady, obit., 124–5
Mount's Bay, 160 *et seq.*
Mourne Mts., County Down, 60 *et seq.*
Mueller, G., *My dear Bannie*, ed. M. V. Mueller, 91
Müller, H, R., 363
Murchison, Sir R., on R.G.S. map room, 12 *et seq.*
Murdock, G. P., *Africa—its peoples and their culture history*, 351
Murray, G. W., obit. of W. J. Bramly, 258–9
Mustagh Ata, The ascent of: Y. Ke-Hsien, 105
Myers, Edward, *see* Toynbee, A.

Nansen the explorer: E. Shackleton, 540
Natal, Indian people in: H. Kuper, 521
Nathan, Lord, elected to Fellowship of the British Academy, 373; PRESIDENTIAL ADDRESS 1960, 261–7; remarks at A.G.M., 382 *et seq.*; on "The ascent of Rakaposhi," 10; on "Exploration on Bolivia-Peru border," 458; speech at Annual Dinner, 386–8
National Research Council, Canada, 252
Navahos, *Paint the wind:* A. Hannum, 108
Naylor, P. E., *see* Mitchell, C. W.
Nepal, Expedns, 120; and India's northern frontiers, 298 *et seq.*; *Window on Nepal:* T. Sekelj, 218–19; *Bibliography*, 219
New England, *see* University of New England, N.S.W.
New South Wales, *The challenge of landscape:* P. A. Yeomans, 99
New Zealand in the making, 2nd ed.: J. B. Condliffe, 91; *A descriptive atlas of N.Z.:* ed. A. H. McLintock, 366; *Early travellers in N.Z.:* ed. N. M. Taylor, 527–8; *Economics of the New Zealand Maori:* R. Firth, 528–9; *Exploration of N.Z.*, 2nd ed.: W. G. McClymont, 90; *Geology of N.Z.:* F. von Hochstetter, 227–8; *Great days in N.Z. exploration:* J. Pascoe, 527–8; *My dear Bannie:* G. Mueller, ed. M. V. Mueller, 91; *New Zealand, a regional view:* K. B. Cumberland and J. W. Fox, 91; *The Torlesse papers:* ed. P. B. Maling, 91
Nigeria, *The erosion of Victoria Beach:* J. E. Webb, 523; *Migrant labour from Sokoto Province, Northern Nigeria:* R. Mansell Prothero, 221; SAND FORMATIONS IN NIGER VALLER BETWEEN NIAMEY AND BOUREM: J. R. V. Prescott and H. P. White, 200–3
Nimrod, Shackleton's ship, 247
Nistri, R., and Prêcheur, C., *La région du nord et du nord-est*, 209
Niven, C. R., made Knight Bachelor, 110
Norfolk, *The making of the Broads:* J. M. Lambert and others, *rev. art.* by I. S. Zonneveld, 341–2
Norfolk Island, Alexander Maconochie of: J. V. Barry, 105
Northern Universities Geographical Conference, *Journal*, 563
Northwest Territory, *Northwest conquest:* L. Paine, 352–3
Northwich, 191 *et seq.*
Norway, *Norwegian cirque glaciers:* ed. W. V. Lewis, *rev. art.* by G. de Q. Robin, 500–3; Arctic, R.N. Colleges Expedn., 113; Univ. of Leicester Botanical-Geographical Expedition, 113

Oceanography, *The earth beneath the sea:* F. P. Shepard, 357; *General bathymetric chart of the oceans: Sheet A.1*, 4th ed., 533; *La topographie et la géologie des profondeurs océaniques*, 97
Ogilvie, A. G., *see* Miller, R.
O'Higgins Glacier, 389 *et seq.*
Ohio State Univ., Institute of Polar Studies, 562
Ordnance Survey, annual report 1958–9, 243; "The mapping of Britain," exhibition, 247; maps in Royal Geogr. Soc., 12 *et seq.*; *Wales and the Marches*, 1-inch map, 75
Oriental despotism: K. A. Wittfogel, 80
Ortelius, on east boundary of Europe, 283 *et seq.*
Overseas Geological Surveys, Annual report, Sept. 1957, 254
Owen, R., *Away to Eden*, 546

Pacific, *Anthropology in the South Seas:* ed. J. D. Freeman and W. R. Geddes, 529
Pacific Science Congress, Tenth, 379
Paine, L., *Northwest Conquest*, 352–3
Pakistan, *Away to Eden:* R. Owen, 546
Pakistan, High Commissioner for, remarks on "Ascent of Rakaposhi," 11
Palmier, L. H., *Social status and power in Java*, 520
Pantanal, *see* Brazil
Parachute Brigade, *see* Alaska Expedition
Paramonga, 397 *et seq.*
Paris region, *see* France
Parker, W. H., EUROPE: HOW FAR?, 278–97
Paschinger, H., *Geogr. Forschungen, Festschrift . . . Hans Kinzl*, 232
Pascoe, J., *Great days in New Zealand exploration*, 527–8
Patagonia, VOLCANIC ACTIVITY ON THE PATAGONIAN ICE CAP: E. Shipton, 389–96
Paterson, G. N., *Tragic destiny*, 218
Patey, Tom, mountaineer, Rakaposhi, 1 *et seq.*
Payne, R., *The white rajahs of Sarawak*, 545
Peel, R. F., obit. of Prof. W. W. Jervis, 257–8; remarks on "Geomorphology of Tibesti," 29
Pegge, A. Deans, ed., *see* Manwaring, G. E.
Penaflorida, Conde de, *see* Mendizabal Gortazar
Period Maps, *see* Geography, Historical
Perm', 185
Permanent Committee on Geographical Names, Lists of Names, No. 3. Czechoslovakia, No. 4. Bulgaria, 244–5
Persia and the defence of India: R. L. Greaves, 80
Persian Gulf States, The: Sir R. Hay, 217
Peru, ASPECTS OF AGRICULTURE AND SETTLEMENT IN PERU: C. T. Smith, 397–409; *Incas and other men:* G. Woodcock, 226; British Museum Expedn., 113; *see also* Apolobamba
Petroglyphs, Tibesti, 19 *et seq.*
Petrov, V. P., *Electric power* (Geography of the Soviet Union, Vol. IV B), 77
Philby, H. St.J. B., letter on "'Arabian sands" by Wilfred Thesiger,' 568; obit. by W. Thesiger, 563–5
Philimore, R. H., *Hist. records of Survey of India, Vol. IV. 1830–1843*, 215–16
Phillips, F. C., *Use of stereographic projection in structural geology*, 356

Phillips, J., *Agriculture and ecology in Africa*, 520–1
Phoenicians, tin trade, 165
Piggott, S., *Approach to archaeology*, 237
Planhol, X. de, *De la plaine pamphylienne aux lacs pisidiens*, 214
Plant geography, *Lehrbuch der allgem. Geogr.: allgemeine Vegetationsgeographie:* J. Schmithüsen, 233–4
Pleistocene period: F. E. Zeuner, 93
Poland, APPLICATION OF GEOGRAPHY IN POLAND: S. Leszczycki, 418–26; British-Polish Geographical Seminar, 115
Polar regions in their relations to human affairs: L. M. Gould, 92; *France et l'exploration polaire:* M. Emmanuel, 529–30; *The white road:* L. P. Kirwan, *rev. art.* by J. N. L. Baker, 70–3
Polunin, N., *Circumpolar Arctic flora*, 229
Port Lockroy, 311 *et seq.*
Portugal, Individuality of: D. Stanislawski, 349; *Portugaliae monumenta cartographica:* A. Cortesão and A. Teixeira da Mota, 547–8
Pounds, N. J. G., *Geography of iron and steel*, 235–6; eds., and Spulber, N., *Resources and planning in Eastern Europe*, 76
Prado y Ugarteche, Dr. M., President of Peru, visit to Royal Geogr. Soc., 247
Prêcheur, C., *see* Nistri, R.
Prescott, J. R. V., and White, H. P., SAND FORMATIONS IN NIGER VALELY BETWEEN NIAMEY AND BOUREM, 200–3
Price, R. J., GLACIAL MELTWATER CHANNELS IN UPPER TWEED DRAINAGE BASIN, 483–9
Prince, H. C., remarks on "History in a map," 50–1
Prince Edward Id., *Three centuries and the island:* A. H. Clark, 224
Pringle, J. D., *Australian accent*, 90
Privateering, *English privateering voyages to the West Indies 1588–1595:* ed. K. R. Andrews, 103
Prokletije, Cambridge Expedn., 113
Protector, H.M.S., 310 *et seq.*
Prothero, R. Mansell, *Migrant labour from Sokoto Province, northern Nigeria*, 221
Proudfoot, V. B., and Boal, F. W., TWO SOIL MAPS OF COUNTY DOWN, 60–6
Pym, C., *Road to Angkor*, 238
Pyrenees, *Problème de la limite géogr. occidentale des Pyrénées:* J. Sermet, 347–8

Qatar, SOME GEOGR. ASPECTS OF QATAR: T. M. Johnstone and J. C. Wilkinson, 442–50

Rachewiltz, B. de, *Egyptian art*, 523
Rakaposhi: M. E. B. Banks, 361–2; British-Pakistani Forces Himalayan expedition, 494 *et seq.*; ASCENT OF RAKAPOSHI: M. E. B. Banks and E. J. E. Mills, 1–11
Randet, P., *see* George, P.
Randles, W. G. L., *L'image du sud-est africain dans la littérature européenne au XVIe siècle*, 84
Rat, P., *Les pays crétaces basco-cantabriques (Espagne)*, 346–7
Raup, H. F., *see* Freeman, O. W.
Reece, Dr. A., obit. by L. P. Kirwan, 567
Reed, A. H., *The story of Hawke's Bay*, 355
Reeve, W. H., PROGRESS AND GEOGRAPHICAL SIGNIFICANCE OF THE KARIBA DAM, 140–6
Reid, G. F., awarded Cuthbert Peek Grant, 247, 384–5
Review, on Defoe, 271
Rhodesia, *see* Kariba
Richards, R. W., *Diary*, 107
Rimli, E. Th., *Switzerland*, 541
Ristow, W. W., *Aviation cartography* (bibliogr.), 553
Robin, G. de Q., 'Behaviour of cirque glaciers,' *rev. art.*, 500–3
Robinson, A. H., *Elements of cartography*, 548–50
Rogate, Sussex, HISTORY IN A MAP: E. M. Yates, 32–51
Rogers, G. W., *Alaska in transition—south-east region*, 352
Rogers, W., *Woodes Rogers, privateer and governor:* G. E. Manwaring, ed. A. Deans Peggs, 104
Romney, D. H., *Land in British Honduras*, 525–6
Rossby, Prof. C. G., *see* Bolin, B.
Rowse, A. L., *The Elizabethans and America*, 357–8
Royal Geogr. Soc., activities 1956–60, 438; Annual Dinner, 386–8; Annual General Meeting, 382–6; applicns. for grants 1961, 373; conferences held at Society's house, 111; contributors to *Journal*, 112, 248, 374, 554; Education Committee, CAREERS FOR GEOGRAPHERS, 451–4; exhibition of Swiss maps, 111; Visit of Pres. of Peru, 247; "The mapping of Britain," 247; G.C.E. geogr. prizes, 554; grants to expedns., 112; *Journal*, a hundred years ago, 67, 202, 339, 499; MAP ROOM OF THE ROYAL GEOGRAPHICAL SOCIETY: G. R. Crone and E. E. T. Day, 12–17; medals and awards, 382–6; meetings: Session 1959–60, 381–2; new members of Council, 373; PRESIDENTIAL ADDRESS 1960: Lord Nathan, 261–7; Research Fellowship, awarded to P. Salway, 374; Special General Meeting, 382; Special Meetings and films, 1959, 110; Training College Prize, 1959, awarded to M. Huddart and M. Baraniecki, 111
Royal Inst. of Chartered Surveyors, 562
Royal Scottish Geogr. Soc., activities 1956–60, 439
Royal Society, The: Sir H. Hartley, *rev. art.* by E. G. R. Taylor, 506 *et seq.*; *Brief history of the Royal Society:* E. N. Da C. Andrade, *rev. art.* by E. G. R. Taylor, 506 *et seq.*
Royal Institute of Chartered Surveyors, annual conf., 562
R.N. Colleges expedns., *see* Norway
Rural sociology, Second European congress of, 559
Ruymbeke, M. van, *see* Leenheer, L. de

Sahara, *Forschungen in der zentralen Sahara: I. Klimageomorphologie:* W. Meckelein, 220; *see also* Tibesti
St. Lawrence Seaway: L. Chevrier, 86; T. L. Hills, 86
St. Michael's Mount, 160 *et seq.*
Salisbury, Third Marquis of, *Persia and the defence of India:* R. L. Greaves, 80
Salomensen, F., *see* Freuchen, P.
Salt marshes and salt deserts: V. J. Chapman, 534–5
Salway, P., awarded Royal Geogr. Soc. Research Fellowship, 374
Samatari, *see* Shirian Indians
Sand formations, *see* Nigeria
Sandbach, 191 *et seq.*
Sandford, K. S., remarks on "Geomorphology of Tibesti region," 27 *et seq.*
São Paulo, *Wandlungen im Antlitz der Landschaft um Sao Paulo (Brasilien):* K. Hueck, 353–4
Saratov, 182 *et seq.*
Sarawak, The white rajahs of: R. Payne, 545
Sardinia, *see* Mediterranean
Savage, R. J. G., remarks on "Geomorphology of Tibesti region," 28–9
Savanna, *see* Brazil
Savigear, Ronald, remarks on "Geomorphology of Tibesti region," 27–8
Scaioni, E., *Mari, glaciers, volcans*, 98

Schall, H., *Die chemische Industrie Deutschlands*, 211
Schapera, I., ed., *David Livingstone: family letters*, 222–3
Schlüter, O., obit. by K. A. Sinnhuber, 123–4
Schmithüsen, J., *Lehrbuch der allgem. Geogr. allgem. Vegetationsgeogr.*, 233–4
Schweigger, E., *Die Westküste Südamerikas*, 354
Science, History of, *Short history of scientific ideas to 1900:* C. Singer, 536–7; *The Transits of Venus:* H. Woolf, 535–6
Scilly Isles, 165
Scorer, R. S., *Weather*, 98
Scotland's splendour: ed. J. B. Foreman, 541
Scottish Field Studies Assoc., at Garth field centre, 563
Scullard, H. H., *see* Heyden, A. A. M. van der
Sekelj, T., *Window on Nepal*, 218–19
Senex, J., *New general atlas* and Defoe's 'Tour', 274
Sengupta, P., *Indian jute belt*, 350
Sermet, J., *Le problème de la limite géographique occidentale des Pyrénées*, 347–8
Shackleton, E., *Nansen the explorer*, 540
Sheffield Univ. Geogr. Soc., *see Don*
Shepard, F. P., *The earth beneath the sea*, 357
Sherda, Tibesti, 20 *et seq.*
Sherman Inlet, 336 *et seq.*
Shimer, J. A., *This sculptured earth*, 524
Shipton, E., VOLCANIC ACTIVITY ON THE PATAGONIAN ICE CAP, 389–96.
Shirian Indians, *Red cloth and green forest:* A. Vinci, 88
Shirley, A., *South from Toulouse*, 541–2
Siam, *The mask of Siam:* D. Barnett, 109
Siberia, *see* Arctic
Sicily, *see* Mediterranean
Simpson, C., *Wake up in Europe*, 546
Singer, C., *Short history of scientific ideas to 1900*, 536–7
Sinnhuber, K. A., obit. of O. Schlüter, 123–4
Skelton, R. A., 'The Map Room, British Museum,' 367–8; remarks on "History in a map," 49
Slieve Croob, County Down, 60 *et seq.*
Slim, Rt. Hon. Viscount, elected to R.G.S., 554
Smailes, A. E., *North England*, 344
Smith, C. T., ASPECTS OF AGRICULTURE AND SETTLEMENT IN PERU, 397–409, remarks on, 411–12
Smith, L. P., *Weathercraft*, 534
Snell, remarks on "A hydrographic unit in British Antarctica," 317
Soil maps, *see* Cartography
Sokoto, *see* Nigeria
Sola Khumbu, British Expedn., 114
Solomon Ids., *This island's mine:* W. Fowler, 228
Somaliland, khat imports, 55 *et seq.*
Somalis, *The Horn of Africa:* J. Buchholzer, 85
South Harting, Sussex, HISTORY IN A MAP: E. M. Yates, 32–51
Soviet Central Asia, *see* U.S.S.R.
Soyer, R., and Cailleux, A., *Géologie de la région parisienne*, 238
'Spain: a geographical background,' letters by W. B. Fisher, H. Bowen-Jones and R. Aitken, 125–7; *Les pays crétaces basco-cantabriques (Espagne):* P. Rat, 346–7; *Wines and castles in Spain:* T. A. Layton, 238
Spanish Armada, *see* Geography, Historical
Spate, O. H. K., *see* East, W. G.
Spiti, *see* India
Spreitzer, H., *see* Wiche, K., ed.
Spulber, N., *see* Pounds, N. J. G.
Stalingrad, 185 *et seq.*
Stamp, Prof. L. D., *Applied geography*, 360; remarks on "Agriculture and settlement in Peru," 409 *et seq.*
Stanislawski, D., *The individuality of Portugal*, 349
Stark, F., *Riding to the Tigris*, 218
Steers, Prof. J. A., receives Victoria Medal, 247 384
Stefansson, E., *Here is Alaska*, 109
Stefansson, V., *Northwest to fortune*, 531
Stephenson, A., remarks on "A hydrographic survey unit in British Antarctica," 316
Stevenson, A., *World's lighthouses before 1820*, 545
Steward, J. H., and Faron, L. C., *Native peoples of South America*, 225–6
Stommel, H., *The Gulf Stream*, 98
Strabo, on Cornish tin trade, 162 *et seq.*
Strahlenberg, on eastern boundary of Europe, 286
Stratton, F. G. M., obit. by E. Hindle, 566
String-bogs, *see* Arctic
Sully, on Russia in Europe, 280 *et seq.*
Sverdrup's Arctic adventures: T. C. Fairley, 540
Swiss Foundation for Alpine Research, Yearbook, eds. M. Kurz and H. R. Muller, 363
Switzerland: E. Th. Rimli, 541; exhibition: Mapping of Switzerland, 111
Syzran', 184 *et seq.*

Tanganyika, Handbook of, 2nd ed.: J. P. Moffett, 83; *Bush and boma:* J. Cairns, 85
Tarradale House, as centre for field studies, 562
Tashjean, J. E., *Where China meets Russia*, 213
Taylor, E. G. R., 'Reign of science,' *rev. art.*, 506–10; ed., *The troublesome voyage of Captain Edward Fenton 1582–1583*, 236
Taylor, N. M., *Early travellers in New Zealand*, 527–8
Tees-side at mid-century: J. W. House and B. Fullerton, 515
Teixeira da Mota, A., *see* Cortesão, A.
Templer, Field-Marshall Sir Gerald, remarks on "The ascent of Rakaposhi," 11
Thailand: N. F. Busch, 545
Thesiger, W., *Arabian sands*, 73; letter on '"Arabian sands" by Wilfred Thesiger,' 568; obit. of H. St.John B. Philby, 563–5
Thomas, E. M., *The harmless people*, 85
Thomas, T. M., *Geomorphology of Brecknock*, 515
Thomson, A. A., and Middleton, D., *Lugard in Africa*, 84
Thornton, H. G., made Knight Bachelor, 373
Thorp, R. W., and Bunker, R., *Indian killer*, 87
Thrower, N. J. W., *Annals of the Association of American Geographers, Map Supplement*, 372
Tibesti, GEOMORPHOLOGY OF THE TIBESTI REGION WITH SPECIAL REFERRNCE TO WESTERN TIBESTI: A. T. Grove, 18–31
Tibet and India's northern frontiers, 298 *et seq.*; *Tragic destiny:* G. N. Paterson, 218; *see also* Lolas
Tibet Society of the U.K., note on, 376
Tierra del Fuego, *Sfingi di ghiaccio:* Father de Agostini, 106; 129 *et seq.*
Tikopia, Social change in: R. Firth, 528–9
Times Atlas of the World. Mid-century edition. Vol. II. Southwest Asia and Russia: ed. J. Bartholomew, 365
Tin trade, 161 *et seq.*
Tonga, 143 *et seq.*
Torlesse, C. O., *The Torlesse papers*, ed. P. B. Maling, 91
Toussidé, Tibesti, 20 *et seq.*
Toynbee, A., and Myers, Edward, *Historical atlas and gazetteer*, 68
Travel, *Harvest of journeys:* H. Innes, 544
Tregear, T. R., and Berry, L., *The development of Hong-Kong in maps*, 350
Tropics, *The tropical world:* Pierre Gourou, 234
Tuan, Yi-fu, *Pediments in southeastern Arizona*, 224–5
Turkestan in the nineteenth century: M. Holdsworth, 217

Turkey: introduced by Lord Kinross, 364; *De al plaine pamphylienne aux lacs pisidiens:* X. de Planhol, 214; maps, 245–6; *see also* Kurdistan
Tweed, GLACIAL MELTWATER CHANNELS IN THE UPPER TWEED DRAINAGE BASIN: R. J. Price, 483–9
Tyrol, *see* Austria

Uganda in black and white: H. B. Cott, 544; *The alien town: patterns of settlement in Busoga:* A. E. Larimore, 521–3
Ullendorff, E., *The Ethiopians*, 351
Underhill, F. H., ed., *The Canadian Northwest*, 223–4
Ungava Bay Papers, 530
U.S.S.R., *Back to Bokhara:* F. Maclean, 218; *Electric power:* V. P. Petrov, 77; commemoration of Darwin Centenary, 374; Geogr. Soc. Third Congress, 253; THE MIDDLE VOLGA—AN EMERGING FOCAL REGION IN THE SOVIET UNION: D. J. M. Hooson, 180–90; Russia considered as belonging to Europe or Asia, 280 *et seq.*; *see also Times Atlas of the World*
United States, *Indian killer:* R. W. Thorp and R. Bunker, 87; *Lost mines of the old west:* J. F. Dobbie, 542; *This sculptured earth:* J. A. Shimer, 524; *The urban community:* N. Anderson, 515–16
University of New England, N.S.W., department of geography, 374–5
Ural Mts., considered as eastern boundary of Europe, 284 *et seq.*
Uvira, *see* Congo Republic

Vakili, A., and others, *Niveaux optima des villes*, 348–9
Vale of Clwyd, *see* Clwyd
Venezuela, *Arboles en flor de Venezuela*, 542
Verulam, Lord, obit., 566
Victoria, *Physiography of Victoria:* E. S. Hills, 527
Viedma Glacier, 389 *et seq.*
Vinci, A., *Red cloth and green forest*, 88
Visdal, Glasgow Univ. Survey, 112
Volga, *see* U.S.S.R.
Volga-Don canal, 187

Waldbaur, H., *Landformen im mittleren Europa: morphographische Karte mit Reliefenergie*, 1:2M, 240–1
Wales and the Marches: Ordnance Survey 1959, 75; *see also* Denbighshire
Wallwork, K. L., SOME PROBLEMS OF SUBSIDENCE AND LAND USE IN MID-CHESHIRE, 191–9
Walter, M. O., *see* Carter, C. C.
Ward, R. G., CAPTAIN ALEXANDER MACONOCHIE, R.N., K.H., 1787–1860, 459–68
Warntz, W., *Towards a geography of price*, 100
Wartha, J., *Die Häfen der nordlichen Adria und ihre Beziehungen zur österreichischen Aussenwirtschaft*, 517–18
Warwick, G. T., *Some observations on by-passed swallow-holes in the Meuse and Lesse valleys*, 517
Washburn, B., *Mount McKinley, Alaska*, 552
Watson, J. W., awarded Murchison Grant, 247, 384; *see also* Miller, R.
Weather: R. S. Scorer, 98
Weaver, River, 192 *et seq.*
Webb, J. E., *Erosion of Victoria Beach*, 523
Weis, G., *Le pays d'Uvira*, 221–2
Wern-fach, 323 *et seq.*
West Indies, *English privateering voyages to the West Indies 1588–1595*: ed. K. R. Andrews, 103
Whelpton, E. and B., *Sicily, Sardinia and Corsica*, 542
White, H. P., *see* Prescott, J. R. V.
Wibberley, G. P., *Agriculture and urban growth*, 343–4
Wiche, K., ed., *Physische-geograph Studien, Festschrift zur Vollendung des 60. Lebensjahres von Hans Spreitzer*, 232–3
Wilkinson, J. C., *see* Johnstone, T. M.
Williams, W. W., *Coastal changes*, 533–4
Williamson, J. A., *The English Channel*, 208–9
Willmot, G. F., and others, *York: a survey*, 1959, 208
Wilson, F. B., *see* Goldthorpe, J. E.
Wincham, 193 *et seq.*
Winsford, 191 *et seq.*
Wise, M. J., visit to Japan, 117
Wittfogel, K. A., *Oriental despotism*, 80
Wolf, E. R., *Sons of the shaking earth*, 353
Wolfson Foundation Grant for Exploration, 373
Woodcock, G., *Incas and other men*, 226
Woolf, H., *The Transits of Venus*, 535–6
Woolley, Sir L., obit. by L. P. Kirwan, 256–7
Woolya, 131 *et seq.*
Worcester, C. R. G., *The junk man smiles*, 363
Wright, J., remarks on "A hydrographic survey unit in British Antarctica," 317
Wright, N., *The quest for Franklin*, 92
Wynne-Edwards, C. J. C., A HYDROGRAPHIC SURVEY UNIT IN BRITISH ANTARCTICA, 310–17

Yāqūt, *Introductory chapters of Yāqūt's Mu'jam al-Buldān*, tr. Wadii Jwaideh, 104
Yates, E. M., HISTORY IN A MAP, 32–51; MAP OF ASHBOURNE, DERBYSHIRE, 479–81
Yazz, Beatien, *Paint the wind:* A. Hannum, 108
Yemen, Khat, 52 *et seq.*
Yeomans, P. A., *The challenge of landscape*, 99
York: a survey: 1959: G. F. Willmot and others, 208
Yousuf, H.E. Lieut.-General Mahommed, *see* Pakistan, High Commissioner for
Yugoslavia, *Die Flurformen Sloweniens:* S. Ilešič, 212–13

Zambezi, 140 *et seq.*
Zanzibar, *see* Africa, East
Zeuner, F. E., *The Pleistocene period*, 93
Zhigulevsk, 185
Zonneveld, I. S., 'The Norfolk Broads,' *rev. art.*, 341–2
Zoogeography: ed. C. L. Hubbs, 233
Zouar, Tibesti, 20 *et seq.*

INDEX TO MAPS AND PLANS

WORLD AND MAJOR REGIONS

World, according to Grynaeus, 281; according to Hecataeus and Pomponius Mela, 279

BRITISH ISLES

Cheshire, subsidence and derelict land use, 192, 194
Cornwall, the position of Iktin in Mount's Bay. 160
County Down, geology, 61; sources of soil textures, 63; soil textures, 64; soils, 65
Denbighshire, relief and drainage, 319; geology, 321–2; Elwy and tributaries, cross-sections, 324; long profiles, 323, 325; stages in evolution, 326; lower Elwy valley, 327
Derbyshire, Ashbourne, map *c.* 1547, 480–1

Great Britain, Defoe's journeys, 270
Scotland, upper Tweed basin, 484–5, 486
Sussex, dating the cultural landscape, 36; Harting, field system *c.* 1400, 38
Wales, North, coastal erosion platforms, 332

EUROPE

Europe, 18th, 19th and 20th century boundaries, 292; map in Ortelius's *Theatrum*, 1570, 285; map in J. Stumpf's *Landtafeln*, 1562, 284; R. Mercator's map, 1608, 284–5; tin routes from Britain to Marseilles, 166
U.S.S.R., the growth of industry 1940–56, 186; Middle Volga, 180–1; Kuybyshev and its environs, 188; urban population centres, 187

EURASIA

Eurasia, boundaries giving part or all of Siberia to Europe, 287; 16th and 17th century boundaries, 282; subdivisions, 291

ASIA

Asia, map to illustrate Article 9 of the Simla Convention, 1914, 308; map attached to the Simla Convention signed by Great Britain and Tibet on 3 July, 1914, 309
Arabia, Qatar peninsula, 443
India, northern frontiers, 302, 308–9
Iraq, Middle Diyālá, 460
Himalaya, Bara Shigri glacier, 482
Rakaposhi, approaches and ridges, 4; and Kara koram, 2

AFRICA

Africa, Northern, new states, 378
Ethiopia, Gende Alisho, village and cultivated land, house sites and gardens, 53
Kariba Lake, 143
Niger Valley, surface deposits, 200
Rhodesia, 141
Tibesti, geological maps and diagrams, 20; north of Bardai, 22; Debasser, 23

SOUTH AMERICA

South America, 131
Bolivia-Peru border, Nudo de Apolobamba, 458
Brazil, Arinos-Juruena region, tribes, 251; vegetation, 177
Patagonia, 390, 393
Peru, general map, 398; Arequipa, 406; Ica valley, 402, 404
Tierra del Fuego, 131

POLAR REGIONS

Antarctica, west Graham Land, 310
Arctic, Canadian, 336

INDEX TO ILLUSTRATIONS AND DIAGRAMS

BRITISH ISLES

Sussex, arable belt on the Sandgate and Bargate Beds, 32; growth of woodland on West Harting Down, 32; Langley House, 33; Little Langley Farm, house, 33

ASIA

Iraq, Middle Diyālá, 472–3
Rakaposhi, start of the traverse on the ridge, 4; the summit, 5

AFRICA

Ethiopia, Harar region, khat plants and trees, 52; three-year-old khat, 52
Kariba, bush-clearing, 141; completed dam wall, June 1959, 140; rising lake engulfs a Tonga village, 141
Nigeria, sand formations, 202
Rhodesia, Northern, Tonga blacksmith, 142; women of the Bawe tribe, 142
Tibesti, Begour crater, 25; petroglyphs, 25; sandstone hill, 24; sandstones and shales 50 miles north-west of Wour, 24; Trou au Natron from the south, 24

SOUTH AMERICA

Brazil, various types of savanna vegetation, 168–9, 176–7
Patagonia, ice cap and settlers, 394–5
Peru, Arequipa, 398–9
Tierra del Fuego, Button Island, 133; Fuegian native, 132

POLAR REGIONS

Antarctic, motor survey boat used by the Royal Hydrographic Survey Expedition, 1956–8, off the coast of west Graham Land, 311
Arctic, string-bogs, 336–7

GENERAL

Beagle, H.M.S., model, 133
Darwin, C., 1840, 130
Defoe, D., engraving by M. van der Gucht after J. Taverner, 271
Maconochie, Capt. A., portrait and letter, 462–3
Royal Geogr. Soc., first physical globe, by Keith Johnston, 16; H.R.H. the Duke of Edinburgh welcomed by the Mayor of Westminster at the opening of the International Youth Science Fortnight, 266; map room and library, Savile Row, 1900, 12; new map room, Kensington Gore, 1930, 13; map room and basement map store, 1960, 17; Patron's Medal awarded to Prof. Th. Monod, 267; H.M. King of Nepal at R.G.S. 554

END OF VOL. CXXVI

MADE AND PRINTED FOR THE ROYAL GEOGRAPHICAL SOCIETY BY WILLIAM CLOWES AND SONS, LIMITED, BECCLES, ENGLAND